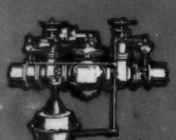
GAS

FORMERLY WESTERN GAS

ENGINEERING • UTILIZATION • LOAD-BUILDING • MANAGEMENT

HIGH PRESSURE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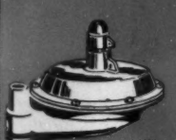
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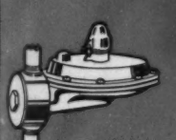

SERVICE

LOW PRESSURE

Leaders

Reynolds

GAS REGULATORS

Have the distinction of keeping AHEAD in safety, accurate performance, economic upkeep and years of service . . . These are some of the built-in factors in Reynolds Gas Regulators that make their continued leadership in the industry a matter of course . . . For every gas control requirement, regardless of its complexity, there is the proper Reynolds regulation . . . Write any branch, representative or the factory concerning any gas control problem—Reynolds engineers are at your service.

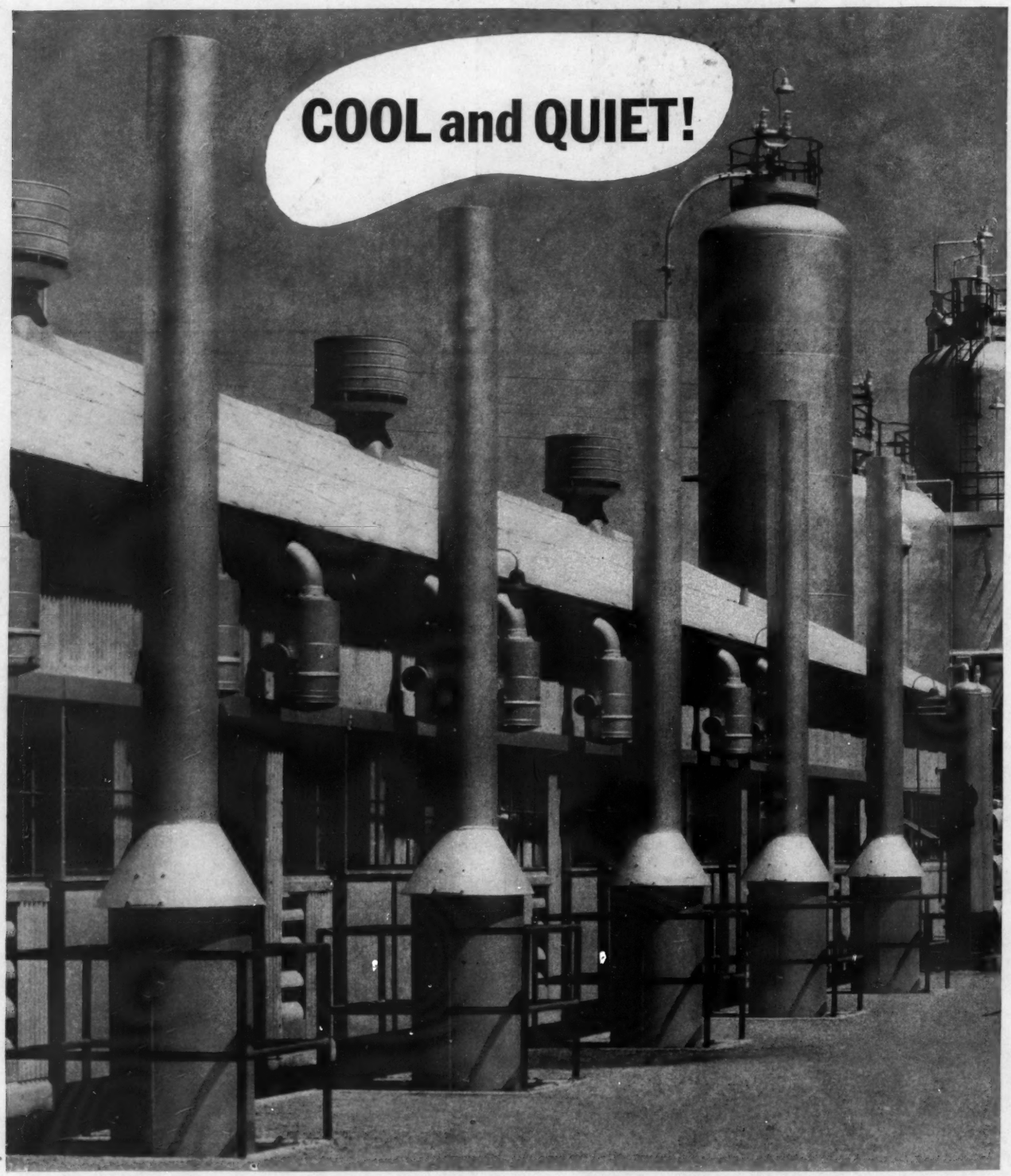
BRANCH OFFICES	REPRESENTATIVES
421 Dwight Bldg. Kansas City, Mo.	Eastern Appliance Co. Boston, Mass.
2nd Unit Santa Fe Bldg. Dallas, Texas	F. E. Newberry Avon, New Jersey

REYNOLDS GAS REGULATOR CO.

ANDERSON, INDIANA, U. S. A.

RECOGNIZED GAS CONTROL SINCE 1892

JUNE 1936 : : 25 CENTS



THIS is an **action** photo of Fluor air-cooled mufflers. There are no sounds,—no steam from air-cooled mufflers; nor is water necessary, or drainage systems, or is there spray to corrode adjacent buildings.

Air-cooled mufflers afford these other positive benefits, too: cooler stack temperatures, consistently low back pressure, greater horse-power output, fewer shutdowns for repairs, cooler floor and engine foundation temperatures, quiet and more efficient engine operation, better engine room ventilation.

Cool and quiet doesn't quite give you all the facts of air-cooled mufflers, but add economy and safety and you have the complete story of their advantages.

Fluor air-cooled mufflers are available in types and sizes for all internal combustion engines. Write for a new Bulletin M-436 describing engineering operations and installation details.

BE SURE WITH FLUOR

FLUOR • CORPORATION • LTD.

909 East 59th St., Los Angeles, Calif.

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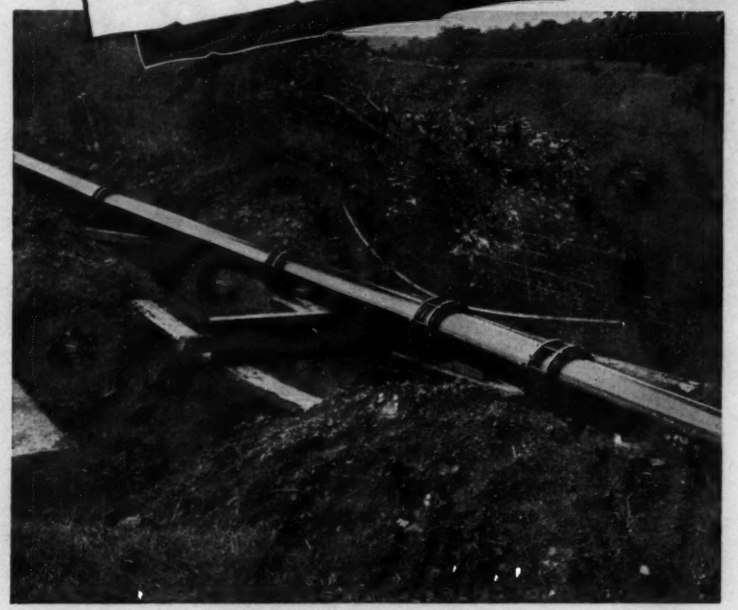
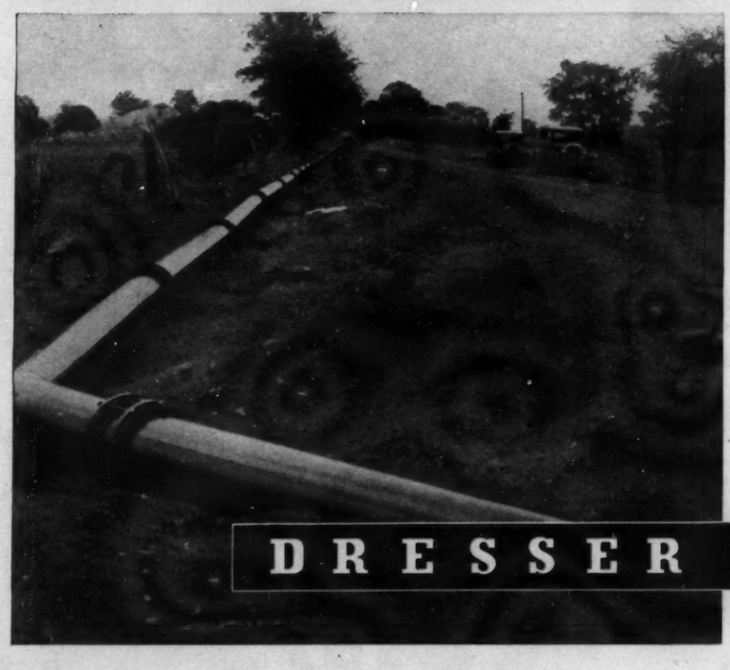
KANSAS CITY, MO.

719 McBirney Bldg.
TULSA, OKLAHOMA

HOW LONDON (ONT.) GOT GAS *Six Months Earlier*





52 miles of gas line laid in 50 days—all joints backfilled before testing—a tribute to Dresser tightness!

Here are a few scenes that help to explain how London (Ont.) got gas six months earlier. Because of the record time that was made—due to the Dresser method of construction—natural-gas service was turned on in early October instead of spring. And although the new line was operated at 300 pounds' working pressure—during one of the worst winters in history—not a single leak was reported.

Construction Highlights. Most of the time, the pipe joiners were actually slowed up by the ditcher, which averaged about 7 feet of advance per minute. No attempt was made to pressure-test any of the Dresser-coupled joints before the line was buried underground throughout practically its entire length. The ditch was only 13" wide.

Dresser Couplings were used on this line for permanent tightness, flexibility, simplicity, strength, and *true* economy. Read about these Dresser advantages in folder No.355—sent on request.

S. R. DRESSER MANUFACTURING CO.
BRADFORD, PA.
In Canada: Dresser Manufacturing Company, Limited
32 Front Street, West, Toronto, Ontario

DRESSER COUPLINGS

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GAS

FORMERLY WESTERN GAS

Publication Office: 810 South Spring Street, Los Angeles, Calif.—Phone Michigan 1481
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JAY JENKINS, Publisher GEORGE H. FINLEY, Editor CRAIG ESPY, Mid-Western Manager
ANATOL FOMILYANT, News Editor W. G. RUSSELL, Field Representative

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June, 1936. Volume XII, Number 6. GAS is published monthly by Western Business Papers, Inc., at 810 South Spring Street, Los Angeles, California. Subscription price (in advance), 25 cents the copy; $2.00 per year; 2 years, $3.00; $3.00 per year foreign. Entered as second class matter June 1, 1925, at the post office at Los Angeles, under the Act of March 3, 1897. Copyright, 1936.

OFFICIAL PUBLICATION: Pacific Coast Gas Association; Southern California Meter Association.

MEMBER: Audit Bureau of Circulations; Associated Business Papers, Inc.

Reproduction of the micrograph above shows the interlocking of the flakes of the internal reinforcement used by Barrett. By laminating with the waterproofing agent, they give Barrett Pipe Line Enamels unusual toughness and resistance to soil stresses.

For pipe of large diameter, The Barrett Company will furnish equipment required to revolve pipe and spread enamel.

Courtesy Lone Star Gas Company

Barrett

PIPE LINE ENAMELS

The result of a lifetime of waterproofing experience

To the problem of pipe line protection, The Barrett Company brought a lifetime of knowledge and experience in the use of coal-tar pitch for waterproofing tunnels, dams, subways and all types of underground structures. The result was the development of scientifically correct pipe line enamels that have since proved their effectiveness and efficiency in actual application. Wire or write for complete information.

THE BARRETT COMPANY, 40 Rector Street, New York, N. Y.

FIELD SERVICE

Carefully trained Barrett field men will gladly work with you, combining their special knowledge and experience with your familiarity with conditions along the right of way.

PANHANDLE EASTERN

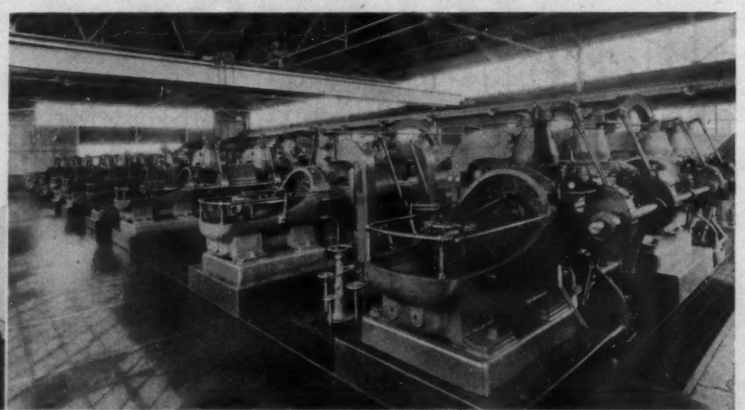
Adds 14 twin COOPER-BESSEMERS to long gas line

..... 17,600 H.P.

IN placing the largest order for compressors since 1930, the Panhandle Eastern Pipe Line Company steps up the original 14,760 Cooper-Bessemer horsepower on the Panhandle line to 33,560 H. P. This increased capacity will feed the new 300-mile extension to Detroit.

With customary foresight, the Panhandle management has again chosen the same make of twin-tandem gas-engine-driven compressor units as before: twelve Cooper-Bessemer units of 1300 H. P. each, and two rated 1000 H. P. each. Cooper-Bessemer four cylinder vertical engines were also chosen for the auxiliary power in these new Cooper-Bessemer equipped stations.

These pictures show the exterior and interior of a typical main-line compressor station erected along the 1350-mile Panhandle line in 1930. The new stations at Houstonia, Mo., Haven, Kans., Greensburg, Kans., and Stinnett, Tex., will also contain Cooper-Bessemer main and auxiliary power.



THE COOPER-BESSEMER CORPORATION

640 East 61st Street . . . . . Los Angeles, California

PLANTS — Mt. Vernon, Ohio — Grove City, Pennsylvania

"WHAT! Clean a meter without Re-Calibration?"

YES . . . .

Foxboro Orifice Meters operate for years without re-calibration

And that means clean the Meter thoroughly—do a complete cleaning job. Think what this means in savings on meter checking; you not only get a longer period of accurate operation before cleaning is necessary, but also spend less time at each meter.

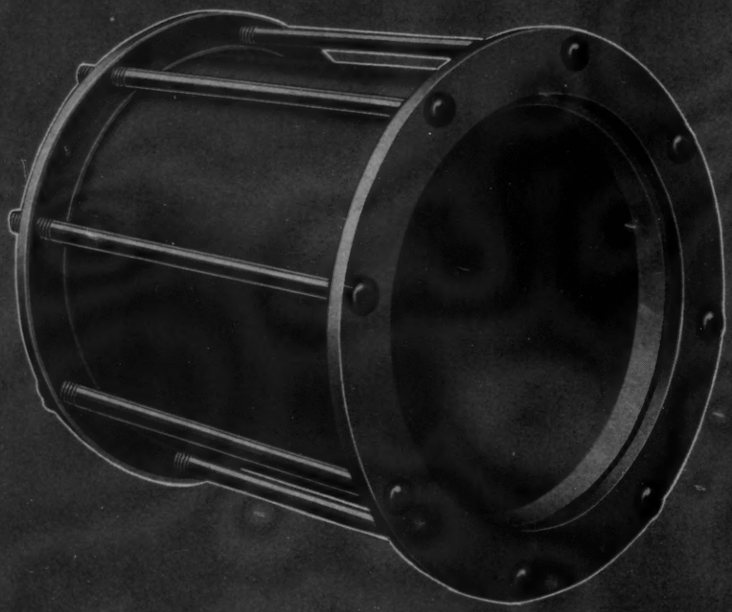
These photographs illustrate how easy it is to clean Foxboro Orifice Meters in a jiffy. In the picture at left, operator is removing the low-pressure chamber; prior to this he had drained the mercury and removed the U-bend. In the center picture, he is wiping away the dust and muck that are sure to accumulate in any orifice meter. In picture at right, he's removing the high-pressure chamber to clean it in the same way. Note that at no time is it necessary to disconnect the meter piping or disturb the setting. Nor can he upset the calibration; the exclusive Foxboro chain and segment construction never gets out of relationship—no links and levers—and requires no adjustments.

Many other features of Foxboro Orifice Meters save you money. Get the straight story before you next buy or specify orifice meters.

FOXBORO
REG. U. S. PAT. OFF.
THE COMPASS OF INDUSTRY

THE FOXBORO COMPANY, 104 NEPONSET AVE.
FOXBORO, MASS., U. S. A. ***Branch Offices in 20 Principal Cities***

ORIFICE METERS

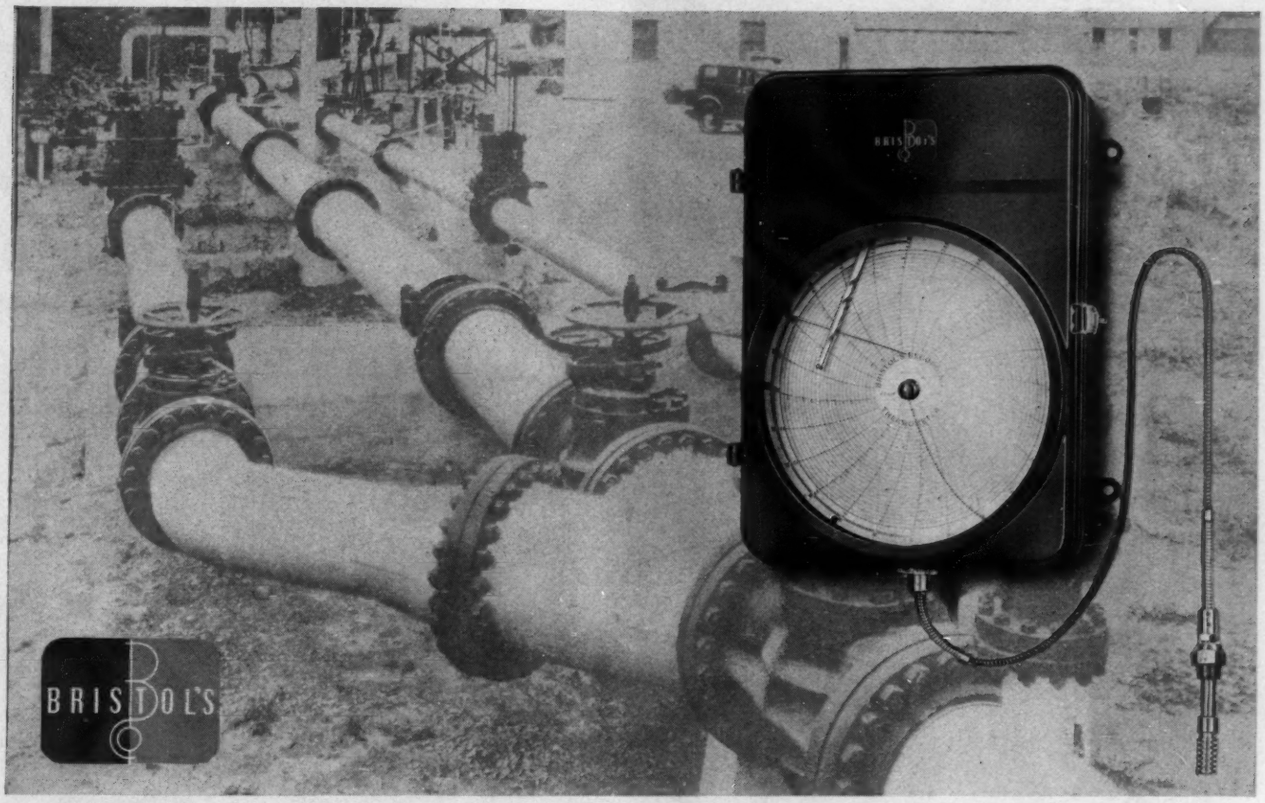


DAYTON
NO. 5
LONG SLEEVES

DAYTON No. 5 Long Sleeves meet the demands of extraordinary expansion and contraction in pipe lines and furnish an ideal method of repairing broken lines.

Built in a full range of sizes with gaskets for any condition.

THE NATIONAL SUPERIOR CO.
DAYTON PIPE COUPLING DIVISION DAYTON · OHIO



Neither *sizzling heat* nor *freezing cold* can falsify your computations!

TO ADJUST metered gas volumes to standard temperature conditions, you must know what the line temperature is. But, how can you measure this? How can you be certain that corrections will be accurate if the readings of your thermometer are influenced by the atmospheric temperature to which the tubing between instrument and bulb is exposed?

Such measurements *will be correct* if you use Bristol's Fully Compensated Class 1 Thermometer, Model 140M. A new development,—it is everything its name implies, *fully compensating*.

Let the temperature along the tubing change! Let it be anything from summer's sizzling heat to winter's freezing cold. The result is just the same, the effect on Bristol's charted temperature record is nil. Bristol's Fully Compensated Class 1 Recorder automatically and unerringly compensates for all temperature fluctuations along the connecting tubing.

QUICK RESPONSE, MAGNIFIED SENSITIVITY, NO HEAT LEAKS

The parallel circular discs, mounted on the sensitive bulb as an axis, increase the bulb area exposed to the gas flow and promote quick thermal response. The long pen arm magnifies even the smallest angular deflection of the measuring element. Thermal insulation at the bulb head prevents heat leaks and inaccurate measurements.

Write for Bulletin No. 1002N. For a description of the complete Bristol's Thermometer line, ask for Catalog No. 1250N, now on the press.

THE BRISTOL COMPANY ✎ WATERBURY ✎ CONNECTICUT

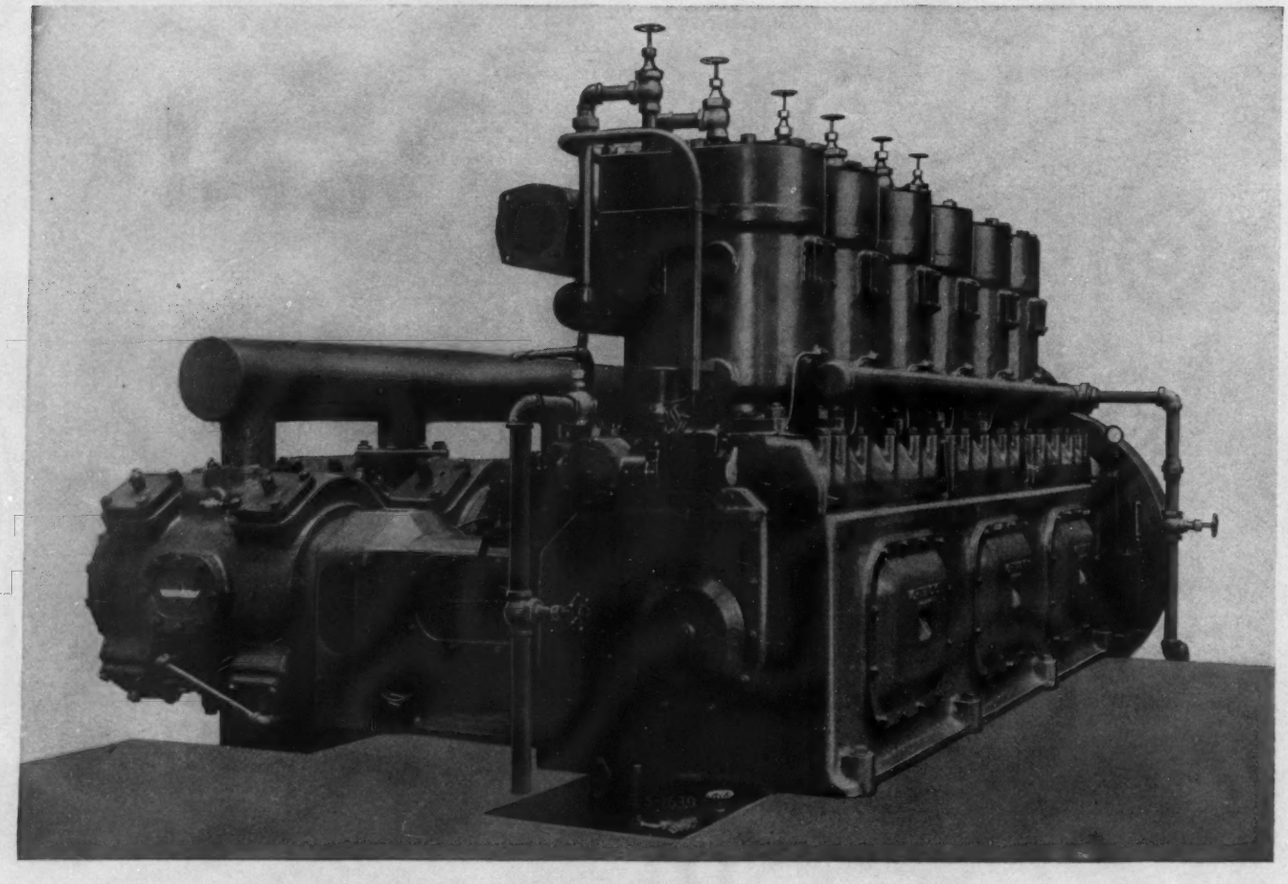
Branch Offices: Akron, Birmingham, Boston, Chicago, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco
Canada: The Bristol Company of Canada, Limited, Toronto, Ontario *England: Bristol's Instrument Company, Limited, London, S.E. 14*

BRISTOL'S

TRADE MARK REG. U. S. PAT. OFF.

PIONEERS IN PROCESS CONTROL SINCE 1889

ANNOUNCING . . .



THE WORTHINGTON ANGLE GAS ENGINE COMPRESSOR

TYPE LCE

• *Compact*

• *Flexible*

• *Accessible*

SIZES: 60-hp.—125-hp.—190-hp.—260-hp.

• ***Literature on request***

WORTHINGTON PUMP AND MACHINERY CORPORATION

General Offices: **HARRISON, NEW JERSEY** - *Branch Offices and Representatives in Principal Cities throughout the World*

WORTHINGTON

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A-36807

GAS
June, 1936

Guest Editorial

THE CROSSROADS

By WALTER C. BECKJORD

Chairman of the Executive Committee; Vice-President and General Manager; Columbia Gas & Electric Corporation

IN the life of every industry there comes a time when it approaches the crossroads. Shall it take the high road—face the issues courageously—make a determined effort to analyze its ever-changing problems and take action on the results of the analysis? Or shall it take the low road—follow the lines of least resistance—with no effort to analyze the situation but with a blind hope that some miracle will happen to save its business from competition, and gradually lose strength and position through attrition? Miracles do not happen any more. Modern business does not develop on a vacillating policy. The race is not always won by the swift, but certainly success is only achieved through intelligent and courageous effort on the part of the leaders of thought in the industry; and these efforts must be forward—there is no turning back.

There are many bases on which our industry may be analyzed; but in my judgment the four vital factors are: 1st, investment; 2nd, promotional rate making; 3rd, appliance sales; and 4th, advertising. No sales philosophy can be sound without a thorough consideration of these essentials. There are many other problems, but if these four are not properly met the others do not count.

No management can keep on spending money for additional plant or distribution capacity unless there is a market for the product. Too many investments have been made without a proper market analysis, and thereby have become a burden upon the company. Fixed charges can only be carried by increasing sales. Any industry that is going to continue to succeed must have a long-range view of its problems, and those problems involve research work, improvement of product, giving more value for the same money, proper employee, customer and stockholder relations, and general acceptance by the public of the value of the service rendered. Temporary success may be achieved without full consideration of all these problems, but in the long run other competitive industries with these factors in mind will certainly make inroads on the business. New uses for the product must be found and a definite and consistent plan of research must be carried on at all times.

THERE has been a definite transition of a large portion of the gas business from the so-called regulated class into the competitive class where competitive promotional rates must be made to get the markets. In other words, from a relatively small retail business involving small consumption per customer, this industry has developed into a wholesale business involving broader activities, mass production and larger sales per customer. Competition is keen on every side, and unless our product can meet the definite requirements of competition it cannot expect to retain its place in the economic cycle.

The development of rates must be such as to encourage increase in business, and the record of the industry shows that it can secure business on a competitive basis if it is properly sold. In the last analysis the customer's dollar is going to be spent where it can secure the most value for the customer, and on that basis the gas industry is in a strong position.

The development in appliances in the last few years has been remarkable, and to some extent this has been brought about by competitive conditions—which are essential to progress in any industry. This progress in development of appliances has been fostered by a sound policy on the part of the American Gas Association and its laboratory facilities.

The sale of appliances involves far-reaching plans for study of markets, purchasing power, finance and credits, as well as dealer relations; and all of these are important factors toward the development of this business.

Any industry has to tell its story to the public in order to make progress in the sale of its product, and that is the phase of the problem which has probably received inadequate attention on the part of the gas industry. It is not only essential to invest large sums of money in plant and distribution systems; money must be spent to create market demand for the commodity. The one without the other does not make a balanced industry; without the market there is no need for plant and distribution systems.

SOME industries have gone down into the discard through a defeatist attitude that has paralyzed them through fear of competition. The one thing that is certain in this world today is change, and any business must take cognizance of the fact that things are moving on, and govern itself accordingly. Unless the problems that face this industry are met with a courageous effort to analyze them properly and adjust operating conditions to meet the new problems that are constantly arising, the industry is bound to suffer. This cannot be done by executives alone; it must be done by the entire organization, each member of which has full knowledge of the problems involved and the objective of selling the industry and its product to the customers.

ORIFICE METERS . . .
FLOWMETERS . . .
Developed and manufactured to standards of accuracy established in the measurement of volumes as minute as the gas pilot light's flow. Noted for their extreme simplicity of construction, ruggedness, and easy adjustment.
AMERICAN METER CO
MEASUREMENT ENGINEERS
CENTENNIAL
1836-1936
IRONCASE METERS . . .
Body, table, partition, outlet channel and diaphragm channels cast as one unit, eliminating internal leakage . . . Alemite lubrication . . . Dust protection of operating parts . . . Scientific metallurgy . . . Diaphragm quality.
BASE PRESSURE INDEXES . . .
They take the mathematics out of customer relations. No clutches or slippage . . . a mechanism which gives positive integration. The great customer satisfaction derived from this instrument in service is striking testimony of its value.
RELIANCE REGULATORS . . .
Appliance, service and industrial types; noted for their patented exclusive features providing positive lockup, accurate pressure control and greatly reduced upkeep and complaint cost.
AMERICAN METER COMPANY
INCORPORATED
Measurement and control of Gas, Oil, Steam, Air and Liquids
PACIFIC METER WORKS • LOS ANGELES • SAN FRANCISCO
653

June, 1936

GAS

Vol. XII, No. 6

TWELFTH YEAR OF PUBLICATION

LOS ANGELES—810 South Spring Street . . 1064 Peoples Gas Building—CHICAGO

A Complete Program for National Advertising

NOW that the industry has committed itself to a campaign of national advertising, with first insertions of copy due to appear next September, it is time for each company to consider how it will utilize this asset in its local program.

Advertising agencies in charge of campaign preparation have submitted prospectuses which closely analyze the steps to be followed. It would be well if every reader could have the opportunity to personally go through these prospectuses, and gain a first hand impression of how carefully this gas industry advertising and publicity program is being set up. Lacking that opportunity, the following general summary will be of interest.

After a thorough analysis of all types of media, recommendation is made that the campaign be confined to national magazines. Local gas companies are urged to employ newspapers, outdoor posters, car cards, motion picture advertising, and radio for effective tie-in with the national campaign.

The gas industry advertising will take the form of full pages in color in a limited group of women's service magazines, plus the Saturday Evening Post. Also included are a group of professional and trade magazines. On the complete list are the following media, with number of insertions shown for each: Saturday Evening Post (9), Good Housekeeping (6), Ladies Home Journal (6), Womens Home Companion (6), McCall's (6), American Home (6), Architectural Forum (12), American Builder & Building Age (12), Domestic Engineering (6), Plumbing & Heating Trade Journal (6). Combined circulations of these magazines number 13,692,913, and the net cost of insertions of gas advertising contracted for 1936-1937 will amount to $382,401.74. In the professional and trade magazine group black and white copy will be used, with four-color copy in the women's magazines and Saturday Evening Post. Under the above schedule some 89,953,764 color pages will go into homes of the United States during the next year—sufficiently impressive to get real attention for gas in the competitive appeal for the buyer's favor.

IN the women's service magazines, editorial content deals primarily with food preparation and household subjects. All of the magazines selected in this group have household institutes and testing kitchens or research laboratories. Readers have a high degree of confidence in both editorial and advertising pages of these media, and the gas advertising should bear fruit in a better appreciation for modern gas service in the modern home. Colorful and appetizing food pictures will accompany illustrations of the newest types of gas ranges, shown in color. Copy will play up the theme that gas is the up-to-the-minute cooking fuel, serving through modern and attractive appliances, and that it has inherent advantages which mean better cooking at lower cost.

While gas for cooking will get primary attention in the women's magazines, the Saturday Evening Post copy will deal with the several domestic services of gas including refrigeration, water heating, and space heating.

Published advertisements are only a part of the campaign activity. A booklet will be prepared which can be secured through the A.G.A. or local gas companies, for coupon use in the advertising. Although this booklet will include recipes and menus, its chief mission will be to tell women how to control and regulate their cooking (with gas, of course) for best results. Title of the booklet is "Cooking Control—A Guide to Better Results".

Every avenue for both magazine and newspaper publicity will be used in connection with the campaign. It is contemplated that a clip sheet and mat service will be distributed to newspapers from coast to coast, featuring newsworthy material with a gas industry slant. A weekly feature for newspaper use known as "Kitchen Aids" will be prepared. Local gas companies will be supplied with a portfolio of publicity and copies of current releases for use in newspapers. A monthly bulletin on publicity, to serve as a clearing house for ideas and local tie-ups which individual gas companies have used with success, is also contemplated. Radio stations will be furnished with scripts which can be broadcast as part of their sustaining programs. Advertisers of food products who use pictures of kitchens in their copy will be contacted and given material for showing gas ranges wherever possible. Leading commercial photographers will be contacted.

AS a part of the general plan it is intended to sell the advertising program to the gas industry, until every employee is familiar with it. Enlarged reproductions of magazine advertising will be available for local display use and for distribution to dealers. Suggested car card copy will be supplied to tie-in with the national campaign. A folder will be prepared which can be sent out with communications to stockholders. A variety of mailing pieces or bulletins to employees will be available, and a portfolio covering all of this tie-in material will later be sent out from Association headquarters to participating companies.

It is also contemplated to conduct a series of regional meetings at which advertising committee and agency representatives will present the campaign features. Participating gas companies will receive frequent bulletins on the campaign, and through every avenue the effort will be made to multiply the national advertising's influence by local advertising tie-ups.

Industrial phases of the campaign, similarly, have been carefully planned, with emphasis upon the following industries: Metals (ferrous and non-ferrous), food industry, ceramic industry, hotels and restaurants, beauty shops.

All of the copy, domestic and industrial, will feature the gas industry as alert and progressive and modern. Its research activities and its new equipment will get attention.

After studying campaign procedure as outlined in advance releases, *GAS* is more than ever convinced of the tremendous good that will come from this effort. This united appeal will be an enthusiasm-builder for better selling, and is already doing its part to create an optimistic feeling everywhere in the industry. This has been the effect of well-run regional cooperative campaigns. They make for a solid industrial consciousness and confidence, which translates into tangible terms of more effective selling and better customer service.

WM. MOELLER, JR. L. B. DENNING, SR. ALEXANDER FORWARD A. E. HIGGINS

BIGWIG FOURSOME

Messrs. Moeller, Denning, Forward and Higgins are seen here in informal pose on the roof of the Dallas Gas Building, taken during Natural gas Department meetings. This foursome carried a big load of convention responsibility—Moeller as Department Chairman, Denning as A.G.A. chief and head of Lone Star, Forward as A.G.A's ever-active managing director, Higgins as equally busy executive secretary for the Natural Gas Department and field representative for the A.G.A.

"BEST YET" DESCRIBES DALLAS MEETING

NOTHING was lacking at Dallas last month to make the natural gas industry's annual convention a worthy successor in the line of fine meetings held under the A.G.A. Natural Gas Department aegis.

A convention can easily be condensed into three or four days of concentrated meetings, but it takes a year of painstaking work to set the stage. Chairman Moeller, Vice-Chairman Welker, Secretary Higgins, and a great many individual committeemen share the credit for the success of the ninth Department meetings, held May 5-8 in Texas' Centennial City. When the registration list was complete it held 784 names, but the banquet head-count of 1423 was much more nearly indicative of this convention's proportions.

Best proof of the high caliber attained by the business sessions this year is the half-dozen papers published either in full or in abstract on other pages of this month's *G A S*.

Best proof that gas men enjoyed themselves is the selection of camera shots on the page opposite. For these the editors express thanks to H. W. Geyer of Southern Counties Gas Co. who took part in the Dallas program and also found time to put his efficient candid camera into frequent action.

No amount of words would serve to reproduce the "geared-for-action" feeling which pervaded the natural gas meetings this year. Perhaps the now assured national industry advertising campaign had a good deal to do with this aggressive and confident spirit. Through the sessions an appreciation was evident that the industry must go to its customers with its story, in advertising, in sales, in a multitude of employee contacts. Keynoting for the convention in his own home town, A.G.A. President Denning put the weight of his opinion on the side of human relations, urging that the industry personnel, from humblest employee to company tops, neglect no chance to make friends of its public.

Dallas gave over two of its leading hotels to the natural gas men. Registrations, general sessions, and the annual banquet held the night of May 6 all took place under the roof of the Baker Hotel, while parallel business sessions and the banquet of the Department Managing Committee, on the evening of May 5, were staged at the Adolphus Hotel, as were also several special meetings of committees.

Subject matter of the convention was presented under the head of general sessions, one of which featured each day, and of numerous parallel sessions for specialized topics. Chairman Moeller presided over the opening general meeting on the afternoon of May 5 and the closing one of May 8.

J. D. Creveling, appointed chairman of the time and place committee for the 1937 annual convention, will bring in recommendations to the Department Managing Committee at the A.G.A. convention next October, following which announcement of dates and place of meeting will be made.

Inside the Baker, where registration desks were spotted.

Angle shot of Magnolia Building, one of Dallas' loftiest.

CAUGHT BETWEEN-BITES are (read from left) Thos. R. Weymouth, Wm. Moeller, Jr., H. C. Cooper. **ON THE ROSTRUM** is United Gas System's T. V. Strange. **PASTEBOARD THUMBING** enroute to Dallas from Los Angeles are (start with cigar and read clockwise) Ed De Remer, Fred Hough, Ken Tomlinson, Joe Creveling and Ben Laulhere.

OVERSIZE CHARTS are light convention reading for Texoma's Elmer Hammerschmidt (pipe) and Fred Hough, Southern Counties. **SERIOUS BUSINESS,** these conventions, thinks Bill Grant (front, center) Lone Star's advertising tops. **PLATFORM POSERS** Jack Delaney (Reliance Regulator) and Ken Tomlinson (Pacific Meter) greeted at Tucson, Ariz., by C. H. ("Sparky") and Mrs. Webber.

OUT OF FOCUS (blame the camera) is El Roy Payne of Payne Furnace & Supply—Convention badge and all. **AT EASE** in a rocking chair, American Meter's Johnny Diehl takes a breather. **IN NEGLIGEE,** Fred Champion of Southern Counties cons a convention paper enroute from Dallas, while Publisher Jay Jenkins of G A S thinks it over.

BUSINESS INTERLUDE: Fred Doyle (P. G. and E.) steals a moment between sessions to greet Dallas' comely rangerettes. **SPEAKERS' DELIGHT:** Giving attentive audience to a convention message is Major T. J. Strickler, Kansas City Gas Co. **TRADE PRESS BOOSTER:** Chas. L. Ferry, industrial head for Southern Counties, looks through convention issue of G A S as the wheels spin toward home.

CANDID-CAMERA-CONVENTIONING WITH THE NATURAL GAS DEPARTMENT.

TWO-STAGE COMBUSTION

for Large Volume Industrial Loads

NO attempt will be made in this paper to discuss the technical details involved in the operation of this process. It has been decided rather to discuss the matter on the basis of its value to the industry as a means of selling more gas at more favorable prices and as a means of improving pipe line load factors.

GEORGE M. PARKER

Anything that will reduce sales resistance is of vital importance. Natural gas men are interested in any process that will increase the value of our fuel and, consequently, the price at which it can be sold. Any method that will help improve the load factor on the pipe line and that will make possible the marketing of large volumes of natural gas at favorable prices during off-peak periods should have careful consideration.

In any diversified industrial district natural gas usually receives favorable consideration in competition with direct-fired coal, fuel oil, manufactured gas, refinery gas, bottled gases and electric energy. Rate making is a simple problem based upon the competitive values of these fuels and in most cases the conversion of furnaces to natural gas is easy and inexpensive.

The replacement of producer gas, however, is another important source of industrial load which unfortunately has heretofore offered tremendous sales resistance. From the standpoint of gas companies it is one of the most desirable, too, since the method of generating and firing producer gas practically insures a large load of uniform demand and constant load factor with few shut-down periods. Up to now the efficient replacement of producer gas with natural gas has required considerable costly alteration in furnace structures and this cost must, of course, be borne by the new fuel, natural gas. The work of redesigning furnaces is slow and interferes with plant production, and in a few cases there is still a large element of doubt that natural gas applied in the conventional manner will be suitable fuel. The natural opposition to radical changes coupled with the uncertainty in the consumer's mind as to what the ultimate result will be has often created a sales resistance necessitating long periods of negotiation before a contract was finally executed. Every day that passes during negotiations and while furnaces are being reconstructed, burners installed, etc., up to the time actual deliveries of gas begin represents lost revenue.

If the furnaces are rebuilt for the efficient use of natural gas, you have, in most cases, destroyed the possibility of the efficient use of producer gas in these furnaces. This further complicates the situation in the mind of the consumer and is not exactly desirable to the gas company with a large winter demand since there is no possibility of having the consumer fire his producers during periods of peak demand and commencing the use of natural gas again during the long off-peak periods, a factor of prime importance to a pipe line company trying to realize a high annual load factor by balancing off-peak industrial and domestic sales. For all of these reasons there is undoubtedly much producer gas load available that has not been replaced and the load that has been obtained from this source has not, in many cases, produced the price it should. True enough, your consumer may leave his furnaces as originally designed for producer gas and find some way to burn natural gas in them, but this is merely a compromise and the natural gas so burned in most cases, will not bring anything like the price it would produce if properly burned in a furnace designed for the use of natural gas.

We believe we have found a way to meet this situation. We do not propose to re-design and rebuild furnaces but have taken the other alternative. We have changed the properties of our gas to suit the furnace and its operating requirements as originally designed for producer gas. The cost of doing this is not great and the enhanced value of natural gas more than compensates. Sales resistance is reduced to a minimum and the flexibility of operation is in no way disturbed. The furnace may still be fired with producer gas. The furnace efficiency remains good. In fact, either the processed natural gas or producer gas can be burned at maximum efficiency. The producer gas generator may be maintained as an emergency stand-by and the load may be contracted for on an off-peak basis, if this is advantageous. The processed natural gas, however, has considerable advantage because of its constant quality and the fixed and accurately controllable conditions under which it can be delivered to the furnace, and because of flame characteristics which make it ideally suitable for certain metallurgical applications. We have accomplished this purpose by a method of processing natural gas which may be regarded simply as two-stage combustion.

The Producer Gas Process

Let us digress for a moment to consider a producer gas generator. It is a device for the gasification of solid carbon with steam and air to hydrogen, carbon monoxide and carbon dioxide; hydrogen being the product of the water gas reaction of the steam with the carbon, the carbon monoxide and carbon dioxide coming from the reaction between carbon and the oxygen released from the steam in the water gas reaction and the oxygen supplied by the air. The water gas reaction is, of course, endothermic and requires a source of heat for completion which is furnished in the generator by the combustion of a portion of the solid carbon with air. The process as a whole is exothermic. The excess heat generated by this exothermic reaction is finally realized as sensible heat in the resultant gas. The resultant gas is a mixture of blue water gas, the volatile constituents of the coal, carbon monoxide formed in the above described reaction and the carbon dioxide that results from the mass condition of the reaction. This mixture of gases is diluted, of course, by the nitrogen present in the air that is blown through the fuel bed in the operation of the process. The mixture of all these products of the process is called producer gas and has a calorific value of from 130 to 160 B.t.u. per cubic foot. This hot producer gas is delivered to a furnace where the proper amount of air for final combustion is supplied. Thus, in its simplest

OF NATURAL GAS

By GEORGE M. PARKER

Mississippi River Fuel Corporation, St. Louis, Missouri *

form a producer gas generator may be regarded as a device for accomplishing the first step in the two-stage combustion of a solid fuel which is: first, to gasify the solid combustibles in the fuel and leave behind the incombustible solids and, secondly, to supply more air at the furnace to completely burn the combustible gases in the furnace.

If we desire to change natural gas of a relatively high calorific value, say 1,000 B.t.u. per cubic foot, into a fuel gas having substantially the same properties and B.t.u. content as producer gas, our problem is much simpler than the generation of producer gas from coal. To begin with, our fuel is already in the gaseous state. We have neither to supply steam for the gasification of carbon nor to maintain high reaction zone temperatures of 2400-2600° F. as commonly required in producer gas practice. The problem resolves itself into one of causing the incomplete combustion of natural gas to take place continuously, the carbon burning to carbon monoxide and the resultant heat of combustion thermally decomposing most of the hydrocarbon constituents of the gas into their basic elements: carbon and hydrogen. Some carbon dioxide is inevitably formed in the process, also some of the hydrogen is burned to water vapor, but both the carbon dioxide and water vapor content are held at a rather low level because they both tend to react with the free carbon present to form carbon monoxide and hydrogen. It is evident that in carrying out the process we have accomplished practically the same result as obtained from the gasification of coal in a producer gas generator; the gas formed has the same calorific value and substantially the same analysis and may be substituted for producer gas quantitatively.

Firing Zinc Ore Roasters

With all of this in mind and spurred by the conviction that natural gas could not be burned efficiently in equipment designed for producer gas, or vice versa, we made experiments over a considerable period of time to check theoretical against actual results, which convinced us that the process was entirely feasible. A processing unit with an hourly capacity of 20,000 cubic feet of natural gas was constructed to deliver a gas similar in B.t.u. content and flame characteristics to producer gas for the firing of two Hegeler zinc ore roasters (See Fig. 1).

The Hegeler kilns were chosen for the reason that these furnaces and furnaces of this type present a most difficult application for natural gas. The roasters operate at high temperatures and as designed require a flame length of 250 feet or more. Kilns of this type often run continuously for five or six years without shut-down. To have applied natural gas in the orthodox way would have meant either waiting until the normal life of the furnaces had expired and then rebuilding these kilns for natural gas firing, or our chosen alternative of producing from our natural gas a gas that would burn efficiently in the existing combustion chambers. Our choice was influenced by another important consideration. Having rebuilt the kilns for orthodox application of natural gas, it would then have been impossible to fire these kilns efficiently with producer gas and in the event of interruption of service there would not be available a stand-by fuel. This was a serious consideration, for if one of these great brick structures cools off, it is likely to be completely ruined, or at least the total life of the kiln will be very much shortened. This contingency, however remote it may be, creates a serious sales resistance which is reflected directly in the price at which natural gas can be sold.

The processing unit when put into operation verified our computations and

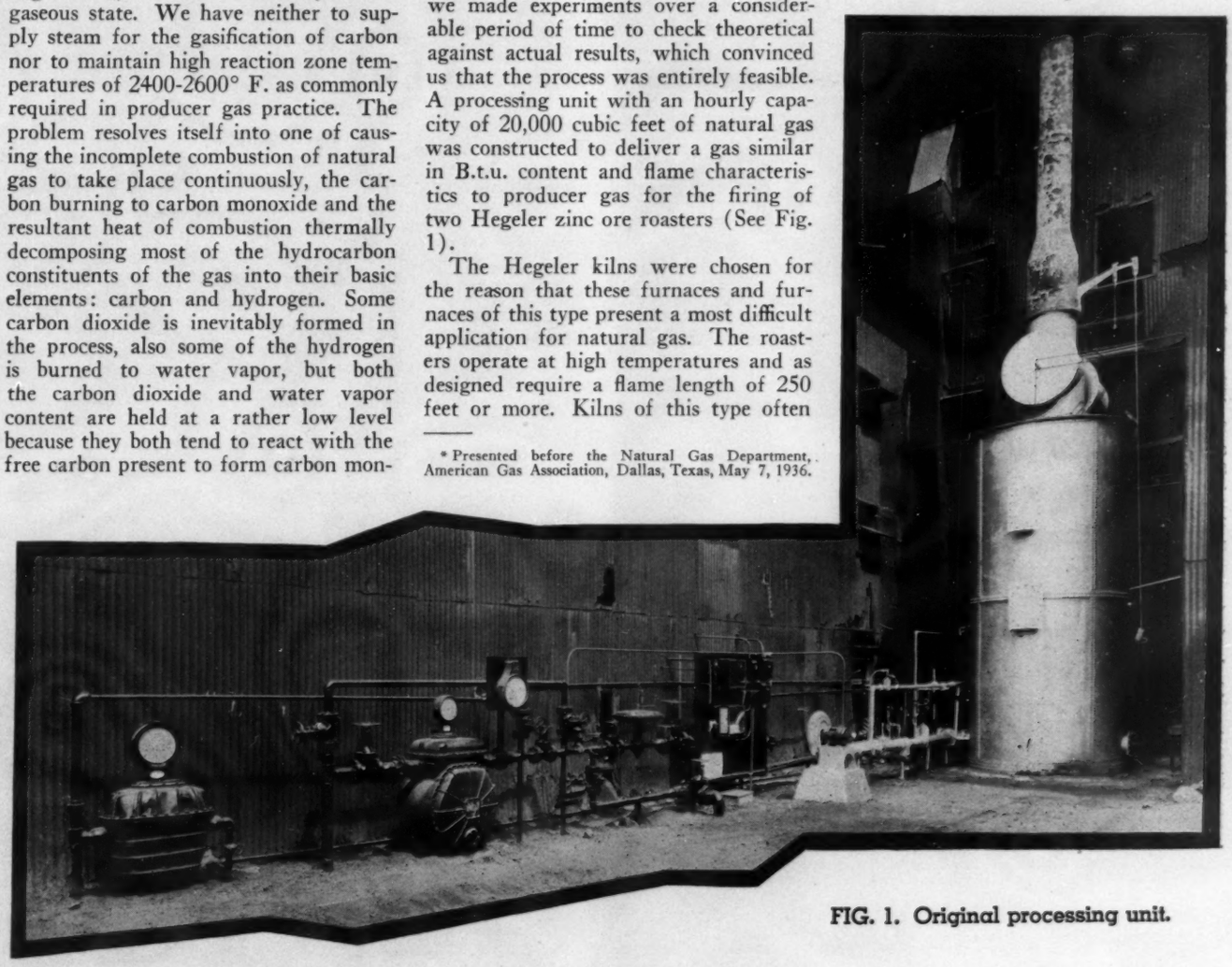


FIG. 1. Original processing unit.

* Presented before the Natural Gas Department, American Gas Association, Dallas, Texas, May 7, 1936.

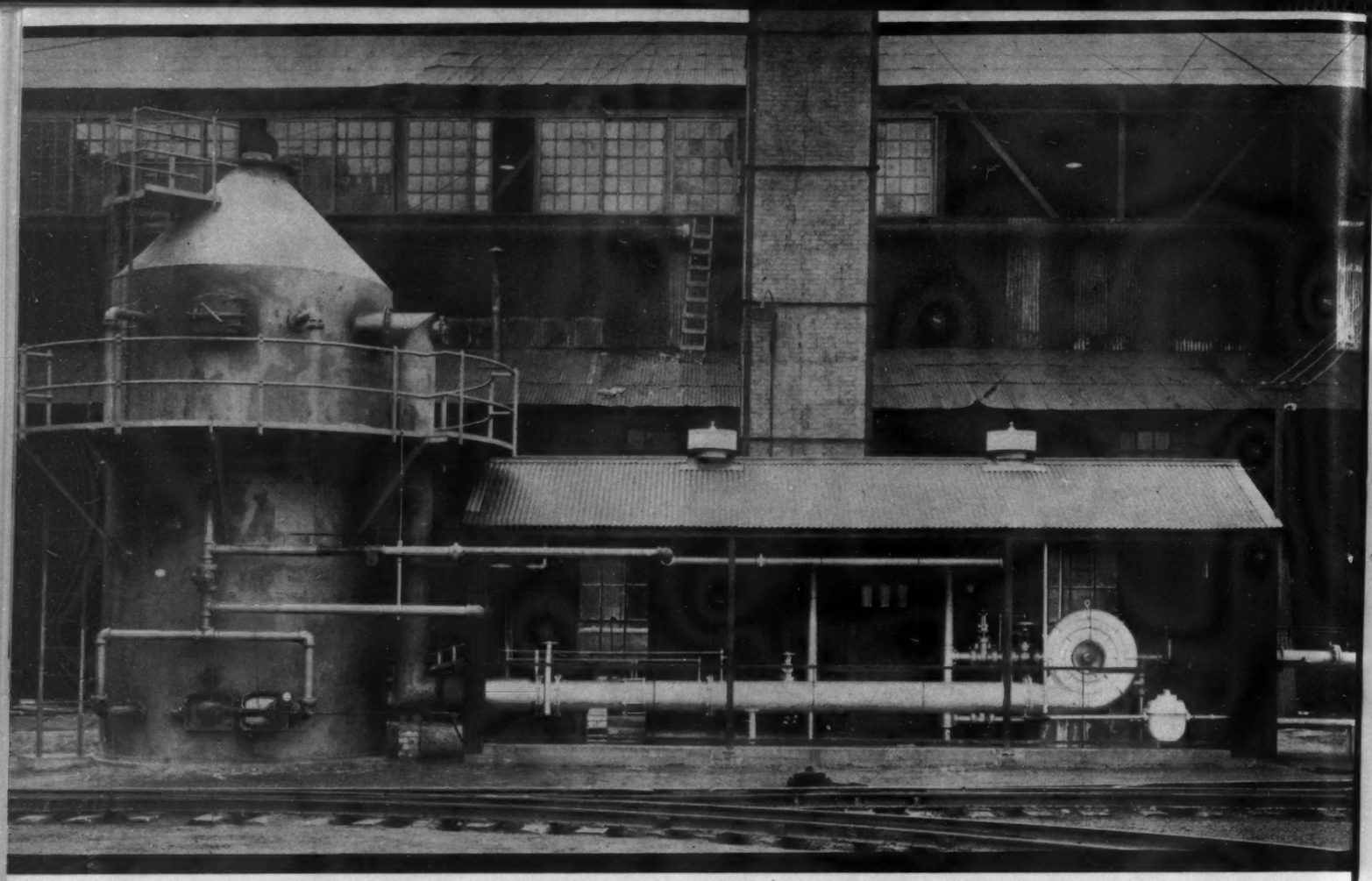


FIG. 2.
Natural gas processing unit.

fulfilled all the expectations of our design. In designing the unit we calculated theoretically that we would produce a gas of approximately 150 B.t.u. The actual gas that was produced upon starting the unit was 155 B.t.u. No shut-down of the Hegeler furnace was necessary. We could go from producer gas to processed natural gas and vice versa at will. The furnace operators observed little change in the flame or characteristics when burning either processed natural gas or producer gas. In fact, they could not tell which gas was being used. It was found that processed natural gas, being of constant B.t.u. content, constant analysis and at a constant pressure, burned in a more satisfactory manner, maintained more even heat distribution in the kilns and allowed the roasting of more ore per hour per B.t.u. input than did the producer gas.

The kilns can now be fired with either all producer gas, all processed natural gas, or mixtures of the two gases, it being possible to bring the producers up gradually while reducing the processed gas or vice versa. This is exactly what was done in starting up. The producers were gradually shut down as the processing unit was brought into operation. Here, then, is the perfect method of replacing producer gas with natural gas. Conditions are not changed. Furnace design remains the same and in the event of interruption of natural gas deliveries producers can be fired up and operations carried on as usual.

TABLE NO. 1

NATURAL GAS

CH_4	90.6%
C_2H_6	2.4%
C_2H_4	1.1%
CO_2	0.3%
O_2	0.0%
N_2	5.6%
	100.0%

Calorific Value—966.6
Specific Gravity—0.606

PROCESSED GAS

CO_2	3.8%
CO	9.2%
O_2	0.5%
Ill. (C_2H_4)	0.2%
CH_4	6.2%
C_2H_6	0.0%
H_2	17.9%
N_2	62.2%
	100.0%

Calorific Value—155.0
Specific Gravity—0.804

It is possible to vary considerably the B.t.u. content, analysis and characteristics of the processed gas. The general procedure is to design and operate the unit so that the first processed natural gas made will closely approximate the B.t.u. content analysis, etc., of the gas to be replaced. It is then possible to vary the B.t.u. analysis of the processed natural gas over considerable range until a gas is found that appears to operate the equipment to be fired at highest efficiency. It has been determined that in most cases furnaces designed for producer gas of 145 or 150 B.t.u. will actually operate with greater efficiency using processed natural gas of somewhat higher B.t.u. A typical analysis of the processed natural gas delivered to the Hegeler zinc furnace is shown in Table No. 1.

Firing Soaking Pits

After the first processing unit had been in successful operation for more than a year and much experimental data secured which verified the design figures, we had no hesitation in proceeding to design a much larger unit to produce a gas of definite characteristics. It was proposed to design and build a unit capable of processing 100,000 cubic feet of natural gas per hour, the processed gas

to be used in the firing of 20 soaking pits at that time fired with producer gas.

Our design was turned over to The Gas Machinery Company of Cleveland, Ohio, by our customer, and they were asked to bid on the erection of an 11-foot unit. The unit was to be automatic in operation and require no attention. Safety devices were to provide for complete shut-down if the air, source of electrical energy, or gas supply failed. The unit was built for them by The Gas Machinery Co. (See Fig. 2 and Fig. 3), and has now been in operation about five months. No difficulty has been encountered in heating steel in the existing pits. Some difficulty has been experienced with reversal valves for the processed gas is several hundred degrees hotter than producer gas. This difficulty has now been corrected. The constant quality of the processed natural gas has been most advantageous and scaling conditions appear to have been bettered, the limiting factor in this regard being the pits themselves. Little difference can be observed between the processed natural gas and producer gas insofar as the type of flame or heating of ingots is concerned. The processed gas flame is heavy, very luminous, and long.

The processing of natural gas in this way is a very efficient operation since the processed gas is used hot. The only measurable losses that can be determined are the heat losses through radiation. This amounts to about 5 per cent of the B.t.u. input. The unit is heavily insulated as are all ducts for the transmission of the hot processed gas. The B.t.u. can be varied through a considerable range as can the amount of free carbon produced. In practice the processed gas is varied over a considerable range until a gas is found that will burn with highest efficiency in the equipment to be fired. It is the finely divided free carbon in the burning gas that produces the high luminousity of the flame. It was at first feared that so much carbon would be deposited in the unit that difficulties might be encountered. But experience has proven that this is not a problem of any moment. Most of the carbon produced is in such a form as to be easily carried along by the velocity of the flowing gases to the point of combustion where it adds density and brilliant luminosity to the flame.

Capitalizing on Free Carbon

The free carbon content of the flame led us to consider still other applications of the two-stage combustion principle. It is well known that natural gas is often at a great disadvantage in replacing fuels having highly radiant flames, such as fuel oil and powdered coal. This is particularly noticeable in a high temperature metallurgical operation like an open hearth furnace. Oil burns with a dense flame having a high radiant energy emissivity factor, and the direction and position of the flame in the furnace is easily controllable. Natural gas is light. There is little body to the flame which is often quite transparent and most of the effective heat must be transmitted to the bath or stock by convection. Unless the naural gas flame can be held down close to the bath and some measure of luminosity obtained in the flame, natural gas is at a distinct disadvantage, which is immediately reflected in its competitive price.

Our experience with processed gas suggested the use of this fuel as a possible solution to just such problems of natural gas application. At the same time it occurred to us that it might be practical to build reaction chambers for the first stage of combustion directly into the regenerative chambers of a reversible furnace which was equipped with separate air and gas checkers. There are many glass melting tanks, open hearth furnaces and other high temperature regenerative furnaces fired or built to be fired with producer gas that would lend themselves readily to such an application without necessitating important furnace changes. Moreover, the regeneration of the gas checkers on the outgoing half of each reversal would furnish an excellent source of stored waste heat to carry out the process.

Opportunity was afforded to work out this design and test this conclusion on a large glass tank. We installed our apparatus so that the gas checkers on each side of the furnace, in fact, became processing chambers. The natural gas was introduced either at the bottom or the top of the gas checkers or at both points. There were five burner ports along each side of the tank. Thes ports were divided horizontally by a tongue arch, the hot gas from the air regenerators coming in through the upper part of the port and the producer gas or processed natural gas coming into the furnace through the lower part of the port under the tongue arch. Combustion begins where the air and gas come together just inside the ports.

The theory of the application was to produce as much free carbon as practical in the processed gas in order to achieve a dense highly radiant flame. Since the gas was processed within the structure of the furnace and close to the burner ports it was found possible to carry much more free carbon in suspension without deposition in ducts and burners than would have been possible if an external processing unit had been used.

It developed that natural gas could be processed satisfactorily in the gas regenerators of the glass tank without complicating the method of reversing the furnace. A flame was obtained similar to a producer gas flame but much

(Continued on Page 61)

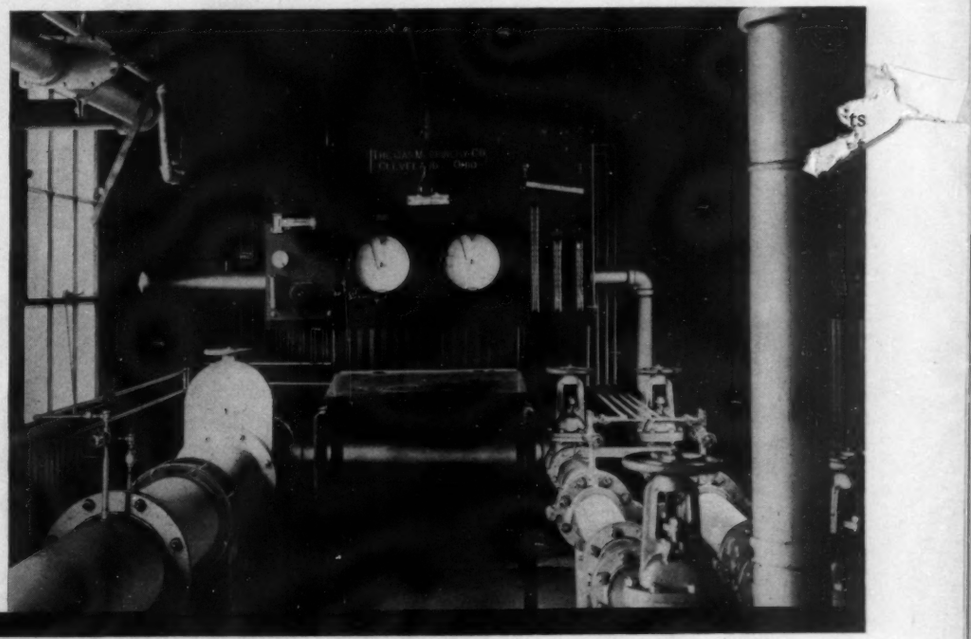
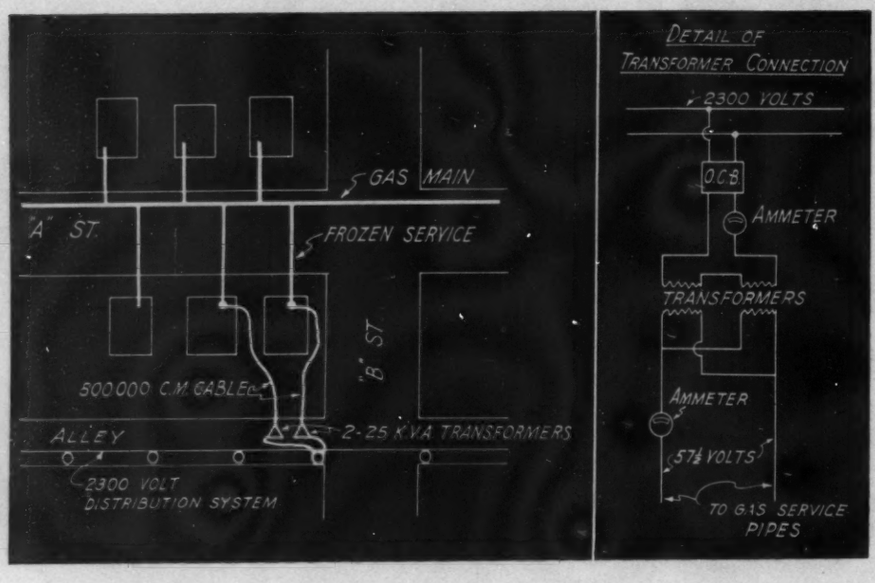


FIG. 3. Gas control panel.



• **Diagram showing set-up for Interstate Power Co.'s pipe-thawing operation.**

THAWING MAINS WITH ELECTRICITY

By E. R. LEHMAN

Division Operating Superintendent
Interstate Power Company
Clinton, Iowa

DUE to the extended extremely cold weather, we experienced a great deal of trouble with frozen gas services and gas mains. Some of these freeze-ups were frozen quite solidly and we were unable to open them with alcohol. Digging is very slow and costly, especially in pavement and frozen ground, and we were at a loss to know how to combat the situation, in order to render the prompt service which utility customers have learned to expect.

Since we operate both the gas and electric distribution systems, it was decided to do a little experimental work with the thawing of pipes electrically. Water pipes have been thawed electrically for years and while there is a vast difference between thawing water pipes and gas pipes, we were of the opinion that the same principle could be applied. The principle employed is: Pipe is used as a conductor of electrical energy; all conductors have resistance, and if sufficiently overloaded will become warm, or hot.

In thawing water pipes, if the temperature of the pipe is raised sufficiently to thaw the ice next to the pipe only enough to allow the passage of water, then water will do the rest of the thawing. This is not true in the case of gas, as the temperature of gas may be well below freezing. In fact, we recorded gas temperatures as low as 25° F. in some of our pipes which were well above the frost line. We realized that it was a more difficult problem than thawing water pipes, but were convinced that if the pipes were heated to any temperature above freezing and were held to that temperature, the frost would melt and run to a drip, where it might be pumped out.

We felt that even though it might require several hours, or more, it would be much more rapid and less costly than digging. Therefore we set out to do a little experimenting. Naturally, we were very busy at that time and did not take time to reduce the experimenting to a scientific basis, recording all data pertaining thereto, but merely went at it with the idea of getting pipe thawed, in order that our customers might enjoy gas service.

We mounted two 25 KVA, 2300-115/230 volt transformers on a truck. We connected the primary coils in series and the secondary coils in parallel. With this connection we received approximately 60 volts on the secondary coils, with the primary connected to our 2300-volt distribution. We connected an ammeter on the primary side and also one on the secondary side. We mounted an oil switch on the truck, connected on the primary side of the transformers. This was used as a convenient means of closing and opening the circuit. We used 500,000 C.M. cable for the secondary leads, to connect the transformers to the gas service pipes, or convenient drip. These were connected to the gas pipes by means of a solder lug, soldered to a ¾-inch copper nipple which could be bushed up to any size fitting that was required to screw on to the gas pipe.

The amount of energy required was dependent on the size and length of pipe connected in the circuit. Usually there would be several sizes of pipe in the circuit and of course the smaller pipe would heat much more rapidly than the larger pipe. In some instances the smaller pipe reached a temperature close to 100° F. before the frost in the larger pipe would melt and allow the gas to flow.

No temperatures were recorded on the larger pipes, as this would have required digging a hole. The ammeter reading on the secondary side varied from 15 amperes to 750 amperes, according to length and sizes of pipes. In several instances, it was necessary to connect the primary coils in parallel, thus obtaining 115 volts on the secondary. This was necessary in order to get enough current flowing to cause the pipe to heat.

We thawed several sections of mains and a number of services successfully. In one instance, the ammeters did not register any current flowing, thus indicating that the circuit was not complete. In this case, we assumed that there must be some joint in one of the services which did not make a metallic contact. We then moved one of our cables to another service, and the ammeters registered current flowing; in due time the frost began to melt and the gas started flowing.

In no case was it required to have current flowing more than 4 hours and in some cases where only service pipes were frozen we were able to open them in 20 minutes.

(Continued on Page 62)

From MARBLES to PLATE GLASS

Natural Gas Important Factor in Glass Industry of Chicago Area

By C. F. HENNESS

Manager of Gas Sales, Public Service Company of Northern Illinois, Chicago, Illinois

IN THE territory within a 100-mile radius from Chicago are a number of medium sized and large glass plants manufacturing a variety of products ranging from marbles to illuminating ware, containers and plate glass. These companies have been attracted to this area by the large Chicago market and the silica sand of the Ottawa district which is famous throughout the world for its high quality.

During the last few years, the advent of natural gas in this territory has resulted in an increased use of both mixed and straight natural gas by the glass companies. In the work of introducing gas into the glass manufacturing operations, the industrial engineer has many opportunities to observe the entire manufacturing operation. It is an intriguing business for the engineer and offers a wide variety of engineering problems for his enjoyment.

The following discussion will not attempt to get into the technical aspects of glass manufacture, but will confine itself largely to a general description of the operation with particular attention to melting equipment.

The working of glass is an ancient art, and a bit of history may be interesting.

The oldest record of manufacturing glass that can be relied upon with certainty comes from the tombs of Egypt where beads were discovered coated with a glaze which is a true glass, as well as pieces of blue glass similar in composition to the glaze upon the beads. According to one authority, glass-making in ancient Egypt, as distinct from the glazing of pottery, dates back to 1600 B. C. when the method employed was to shape the glass around a core of sand.

It was not until hundreds of years later that ware was made from blown glass. Egyptian workmen, attracted to Rome in about the first century B. C., established a number of factories there. Rude drinking vessels were made from glass about the time of Nero. The first recorded use of window glass was in the third century A.D., and, in about 442, cast plate glass was introduced in Rome.

The art of working glass spread throughout the civilized world in the centuries following. Venice became famous for its mirrors and drinking glasses in the 13th century. Foreign workmen were imported into France, England and Germany to teach the natives how to make glassware.

The first important glass works in America was built in 1790 in New Hampshire for the production of window glass. The progress of the industry was slow, however, until the early part of the 19th century. Since that time, however, its growth has been increasing rapidly, resulting in its present important position in the country.

Glass Melting: Naturally, since fuel is such an important material in the manufacture of glass, its utilization has always been one of the major problems of the plant operator. It is required not only for the original melting of the batch but also in many subsequent operations. Since melting is in many ways the most interesting and spectacular of the heating processes, it will be discussed at length.

Types of Furnaces—Pot Furnaces: Melting is done in pots and tanks. Pots are classified generally as open pots and closed pots, and are essentially crucibles. The capacity of pots is necessarily limited and they are, consequently, used mostly in smaller operations or for special glasses, which necessitate an extremely close control of glass composition or color. They are fired externally by being set into a furnace which acts as the combustion chamber for the fuel. The efficiency of melting in pots is lower than in tanks.

Tank Furnaces—Day Tank: Tanks are in two general classifications, day tanks and continuous tanks. A day tank operation is an intermittent process consisting usually of loading the tank in the evening with the batch constituents, melting down during the night and working out the next day. The tank is usually of rectangular shape and is similar to an open hearth furnace. The capacity of such equipment varies from several hundred pounds of glass up to a few tons. This type of furnace is adapted to the smaller operations and to hand-forming of glass. The fuel efficiency is, as a rule, somewhat higher than the pot operation because the application of heat is more direct.

Continuous Tank: The continuous tank, as the name implies, is fed and pulled continuously, the glass forming and refining as the flow progresses from the point at which the batch is introduced to the working end of the furnace. This type of tank is usually rectangular in shape, containing as much as 300 or 400 tons of molten glass and is particularly adapted to large machine operations and high capacity production.

Large tanks usually employ the regenerative method of firing through several ports on each side of the furnace. The large tanks in the territory under discussion were originally built to use producer gas as a fuel. Because molten glass is such an unstable material, it is of utmost importance that heat be applied uniformly. The character of the flame is necessarily of great importance since hot spots in a tank during melting will disturb the homogeneity of the glass to such an extent as to reduce the value of the product or make it worthless. In order to increase the uniformity of heat transfer, an effort is made with all fuels to produce a long luminous or semi-luminous flame which transmits the greater portion of its heat by direct radiation, thereby producing a high melting efficiency. This character of flame normally results from the use of producer gas because of the tar in the gas, and in converting to natural gas it is necessary to simulate this flame condition.

Conversion of Fuels on Continuous Tank: The problem of converting tanks from producer gas firing to natural gas firing offered many engineering problems. Because of the low heating value of producer gas, tanks employing it as a fuel normally have provided a greater volume of combustion space than is the case when tanks have been originally designed for natural gas. The following description of the procedure of convert-

(Continued on Page 51)

GAS HYDRATES and Their Relation to Pipe Line Operation

By W. M. DEATON

Chemist, U. S. Bureau of Mines
Petroleum and Natural Gas Division, Amarillo, Texas*

THE plugging of natural gas pipe lines due to freezing is one of the many problems of the natural gas industry. It is not a new problem but one with which all pipe line operators are familiar, and is so important that many companies go to considerable trouble and expense to eliminate or minimize the freezing hazard. This commonplace difficulty has lately been receiving special attention by the natural gas industry for it has recently been shown by investigators that such freeze-ups are not always due to ordinary ice formation but oftentimes to the formation of solid compounds termed hydrocarbon hydrates. It has been found that these solids may be formed in high-pressure pipe lines at temperatures far above the normal ice point, 32° F.

Results of investigations by the Texoma Natural Gas Co. at its compressor station at Fritch, Texas, are discussed by E. G. Hammerschmidt of the Texoma Co. in the August 1934 issue of Industrial and Engineering Chemistry (Vol. 26, p. 851, 1934). He shows that it is possible for solids to form in a natural gas pipe line at a temperature as high as 60° F. when the gas pressure is 800 lbs. per sq. in., and as high as 45° F. when the gas pressure is 300 lbs. per sq. in. Previous to this work it was commonly assumed that freeze-ups were due to the formation of water-ice and that the temperature at the point of freezing was 32° or colder. In some instances it was known that the surrounding temperature was higher, but it was generally assumed that the temperature within the pipe had been reduced to 32° F. by throttling the gas through some local constriction. Probably many freezing troubles experienced in the metering and regulating of gases, attributed to water-ice, have been due to hydrate formation. For this reason, the subject of gas hydrates has interest to those concerned with gas metering.

As soon as the natural gas industry recognized that gas pipe lines could and often did have freezing troubles at temperatures well above the ice point there was a demand for more information on the subject. At the meeting of the American Gas Association, Natural Gas Department, in Memphis, last May (1935), keen interest was shown in the matter; the Technical and Research Committee of the Association approached the U. S. Bureau of Mines with the request that the Bureau undertake a study of the freezing in natural gas pipe lines; the committee offered to cooperate in the study by extending financial aid and by obtaining information regarding the subject.

After considering the matter and in view of the fact that the Texoma company which had pioneered the study on gas hydrates, had satisfactorily solved the particular problems that prompted their investigations and were planning no further work on the subject, the Bureau of Mines, Petroleum and Natural Gas Division, entered into a cooperative agreement with the American Gas Association for a study of hydrocarbon hydrates and their relation to the operation of natural gas pipe lines.

Work was begun by the Bureau in October of last year at its Cryogenic Laboratory connected with its Helium Plant at Amarillo, Texas. This location was chosen because the Bureau already had facilities there for low-temperature work, it is close to large gas-producing fields from which a number of pipe lines radiate, and the Bureau has several gas wells and a pipe line near Amarillo, which it operates in connection with the Helium Plant, that are available for close study. The work of the Bureau has not proceeded far enough to enable specific data to be presented now. This paper will be confined to a general discussion on the subject and a resumé of information to be found in the literature and obtained through discussion of the problem with members of the natural gas industry.

*Presented at 1936 Southwestern Gas Measurement Short Course, Norman, Okla. Published by permission of the Director, U. S. Bureau of Mines. (Not subject to copyright.)

Properties of Gas Hydrates

The first question to arise is: What are gas hydrates? According to those who have investigated the subject, gas hydrates are compounds consisting of gas and water in chemical combination. The molecular proportion of gas to water is about 1 to 6 or 1 to 7 depending on the gas involved. For methane, the principal constituent of natural gas, the proportion is 1 mole of methane to 6 moles of water. Expressed in more familiar terms, this is a ratio of 234 volumes of methane, measured at atmospheric pressure and 60° F., to 1 volume of liquid water, or 1000 cu. ft. of methane to 32 gallons of water. Regardless of the fact that gas hydrates are solid, much like water-ice, they can be formed in natural gas pipe lines under pressure at temperatures well above the freezing point of water. While they are relatively stable compounds under equilibrium temperature and pressure conditions, they nevertheless may be decomposed readily by properly altering these conditions. The density of gas hydrates has not been reported, however, since they float on water readily their density is less than that of water.

The appearance of gas hydrate as usually obtained from pipe lines is much like packed snow. When freshly obtained it is "gassy", and relatively large volumes of gas are evolved from it. Under these conditions, when ignited, it burns quietly, and usually only a small residue of water is left. This observation is not necessarily a true indication of the relative proportion of liquid water to the volume of hydrate, for undoubtedly some of the water resulting from the decomposition of the hydrate is evaporated during the burning. The hydrate mass is very porous and this high porosity makes it relatively light in weight.

Although the foregoing description applies satisfactorily to the usual hydrate after removal from a pipe line, it is not necessarily an accurate description of the hydrate as it exists in the pipe line under pressure, where it cannot be observed. In the Bureau's study of natural gas hydrates at Amarillo a high-pressure glass-windowed apparatus is used, which permits observation of the behavior of hydrates under conditions simulating those in natural gas pipe lines. Under these conditions, hydrates are observed to form quietly when the temper-

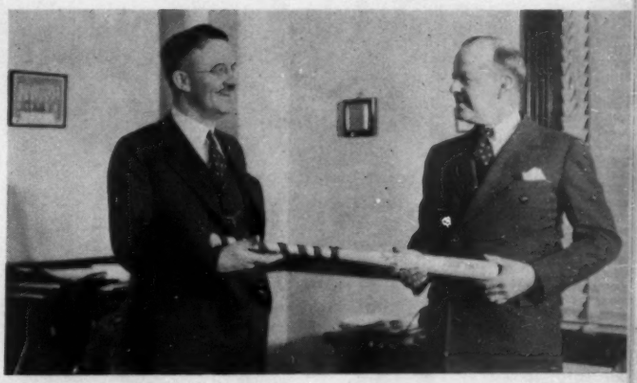
(Continued on Page 58)

GAS CAMERA

VANCOUVER HO!: Soon all air-ways, sea-ways, highways and byways will lead to the evergreen country which surrounds picturesque Hotel Vancouver, headquarters for the joint convention of the Canadian Gas Association and the Northwest Conference of the Pacific Coast Gas Association, July 8, 9, and 10. See news story, page 53.

BRIDGE OF SALES: (Above) Just as engineers are spanning San Francisco Bay with the world's largest bridge, so do salesmen of the San Francisco division of Pacific Gas and Electric Co. intend to "Bridge the Bay" in their intensive domestic sales campaign which will reach its climax Sept. 4 at a get-together "Span-the-Gap" dinner. See news story, page 38.

SERVICE UNDER STRESS: Night and day, while flood waters churned through Cincinnati streets, service men of the Union Gas & Electric Co., clinging to emergency platforms, maintained uninterrupted gas service by pumping the drips in all lines. Underground regulators were by-passed and pressure regulated by hand.



BUSINESS BASEBALL: In Chicago, employees of The Peoples Gas Light and Coke Co. have gone on a batting rampage in the company's "Play Ball" campaign for prospective customers. Vice-president F. X. Mettenet receives a brand new baseball bat from North Shop Superintendent John Williamson, as a symbol of North Shop's determination to turn prospects into sales.

MANCHURIAN ENVOY: Harry L. Masser, Los Angeles Gas and Electric's vice-president and assistant general manager, bids goodbye to Tetsuji Aoki, engineer for the South Manchuria Gas Co., Ltd., Darien, Manchuria, as Mr. Aoki concludes a three-weeks Los Angeles visit to continue his world tour of gas property inspection.

A DAY'S CATCH: (Right) Some 75 yellowtail and tuna were coaxed from warm and placid Mexican waters last month to flop on the deck of the Mascot 2, of San Diego, during the annual fishing party of Ward Heater Co., Los Angeles.

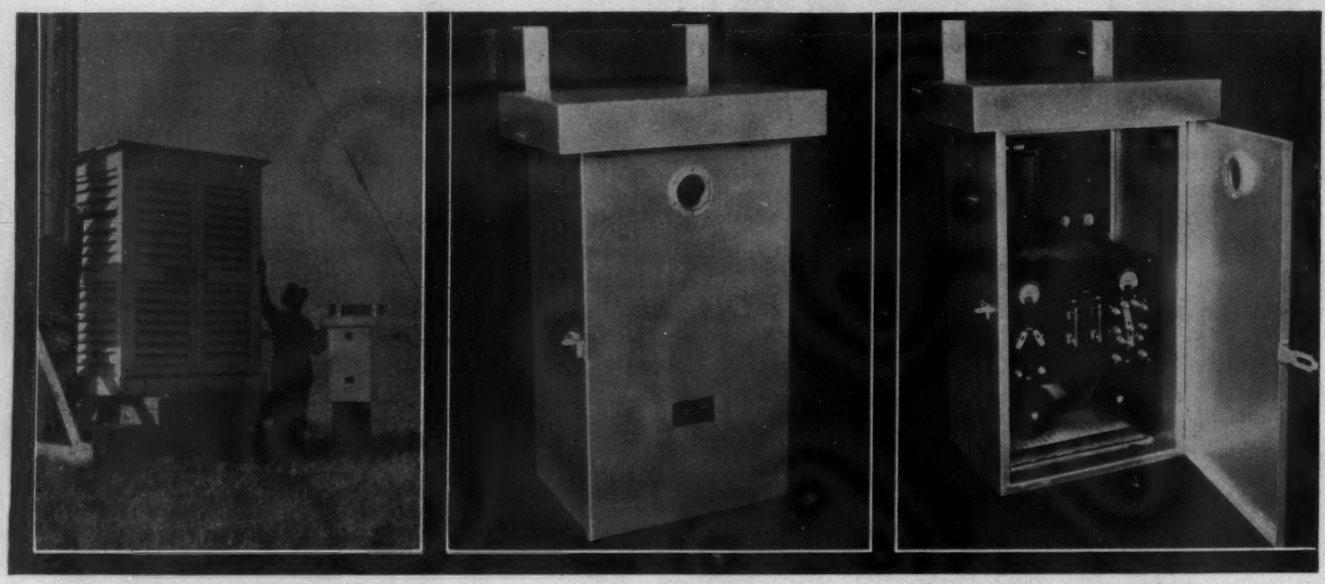


FIG. 1. FIG. 2. FIG. 3.

(FIG. 1.) Old type 40-ampere rectifier with service meter box, and new type combination 50-ampere cathodic corrosion eliminator and meter box. (FIG. 2.) Exterior of cathodic corrosion eliminator. (FIG. 3.) Interior of 8-volt, 50-ampere cathodic corrosion eliminator.

IMPROVEMENT IN ELECTRICAL PIPE PROTECTION EQUIPMENT

SINCE the inauguration of cathodic pipe protection by the Pacific Gas and Electric Co. in 1930[1], many variations and improvements have been made by manufacturers of the electrical apparatus required and also by the many utilities that have adopted electrical pipe protection on their systems to supplement the usual wrappings. These developments have been directed towards the following:

a. Reduction of installation cost.

b. Increasing the reliability of operation.

c. Increasing the efficiency and therefore the reduction of power costs.

d. Decreasing the annual maintenance costs by a reduction of inspection, overhauling and replacement of parts.

Considerable success has attended the work of the Bureau of Tests and Inspection of the Pacific Gas and Electric Co. in obtaining the desired objectives given under the aforementioned headings.

Reduction of Installation Cost: The cost of a complete installation has been reduced to less than one half.

The volume of the 50-ampere unit has been reduced from over 140 cubic feet to 4⅛ cubic. feet. All units are now mounted on one of the service poles, thereby eliminating the necessity of purchasing additional land or right-of-way.

The reduction in weight of the 50-ampere size is from 1500 pounds to 129 pounds, and the cost has been reduced from $1100 to $400.

Increasing Reliability of Operations: The reliability has been so increased that the only attention given is the visual inspection by the meter reader on a monthly trip. He also notes the indications of the d.c. meters and leaves a record on a chart in the cabinet.

Increasing Efficiency: The efficiency of the units has been increased by the use of a new type of light weight metallic rectifier.

The potential at the direct current terminals on 14 of our installations varies from 1.8 to 8.5 volts and averages 4.5 volts. At this potential the efficiency is double that of the units used heretofore. A further reduction in power consumption was obtained by the elimination of a motor-driven ventilating fan.

Decreasing Maintenance Costs: The maintenance cost has been reduced by the elimination of all rotating and moving parts, requiring oiling and cleaning, all thermostats, signal relays, etc., and the use of long-life rectifying elements.

Fig. 1* shows the comparative sizes of the new pole-mounted type of 50-ampere unit and the original 1930 type of 40-ampere unit.

These rectifiers are used in five standard sizes, as furnished by an Oakland electric manufacturer, under the name of "Cathodic Corrosion Eliminators" and will be referred to hereafter by that name.

In Fig. 2 is shown a 50-ampere, 8-volt, cathodic corrosion eliminator and in Fig. 3, an internal view of the same unit.

In Fig. 4 is shown the corrosion eliminator chassis removed from the cabinet.

The rectifying elements have been placed at the bottom of the steel case, over an insect-proof screened opening, to permit the maximum cooling effect. The warm air is carried to the top of the cabinet by the chimney effect and

*Photographs and data by courtesy of Electrical Facilities, Inc., Oakland, Calif.

By W. R. SCHNEIDER

Assistant Engineer, Bureau of Tests and Inspection, Pacific Gas and Electric Company*

discharged through screened openings under the overhanging cover.

The switch panel is equipped with direct current meters and switch, links to permit the use of 110-volt or 220-volt services, and tap changing links permitting the adjustment of the potential on the rectifier elements in one volt steps from 1 to 19 volts.

In the larger units requiring the parallel operation of a number of elements, fuses are placed in the a.c. and d.c. leads. This will prevent the overloading of other elements in case one of them fails.

In the upper portion of the cabinet, and separated from the other equipment by a ¼-inch mesh screen, are placed the fused service entrance switch and the watt-hour meter. This arrangement eliminates the extra service meter box and wiring to the cathodic corrosion eliminator.

The only connections that must be made in the field are the two service wires, and the pilot pipe and pipeline connections. The watt-hour meter leads are already in place and can be readily inserted in the proper terminals of the meter.

All leads are brought into the case through 1¼-inch conduit or service wire connections.

The entire chassis, Fig. 4, of the corrosion eliminator can be removed by disconnecting the four leads on the switchboard and removing four cap screws.

A 3 x 4 x 21-inch buckarm is also provided with the cathodic corrosion eliminator for pole mounting.

In Table No. 1 are given some of the principal dimensions, weight and primary currents of the five standard cathodic corrosion eliminators.

*Presented before the Pacific Coast Gas Association Technical Section Spring Conference, Los Angeles, Calif., March 26-27, 1936.

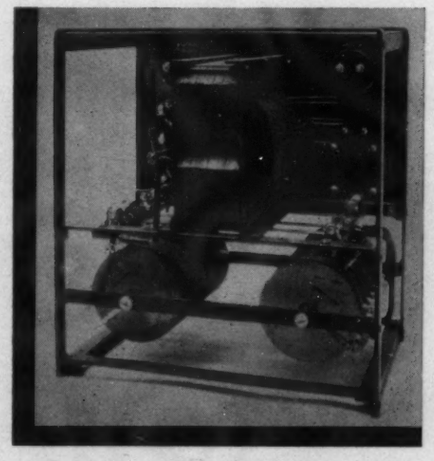


FIG. 4. Chassis of 8-volt, 50-ampere cathodic corrosion eliminator.

TABLE NO. 1.

Cathodic Corrosion Eliminator—Type CBM—Capacity Volts	Amps.	Overall Dimensions Height In.	Width In.	Depth In.	Net Weight Lbs.	Full Load a.c. at 110 Volts
8	10	29¾	16½	9½	66	1.3 amp.
8	15	29¾	16½	9½	70	1.9 amp.
8	20	29¾	16½	9½	72	2.6 amp.
8	35	39 11/16	20¾	14 1/16	123	4.2 amp.
8	50	39 11/16	20¾	14 1/16	129	6.0 amp.

TABLE NO. 2. WEIGHTS OF CAST IRON PIPE GROUND ELECTRODE.

Ampere Capacity of Cathodic Corrosion Eliminator	Total Weight of Pipe Lbs.	Minimum Outside Surface	Minimum Diameter in Inches	Size of Connecting Cables (Rubber-Covered Copper)
10	1500	100	3	4/0 or 250,000 c.m.
15	2250	150	4	4/0 or 250,000 c.m.
20	3000	200	6	4/0 or 250,000 c.m.
35	5250	350	8	4/0 or 250,000 c.m.
50	7500	500	10	4/0 or 250,000 c.m.

Potential and Current

The proper selection of a cathodic corrosion eliminator necessitates two sets of observations, to determine the current and potential required.

One or more ground electrodes are driven at a point shown by an electrolysis survey to require cathodic protection, and connected to the positive terminal of a storage battery. The negative terminal of the battery is connected through an ammeter to the pipeline to be protected.

The soil-to-pipe potential is then measured with a high resistance voltmeter and copper sulphate electrodes. A reading of 9/10 volt from copper sulphate to pipe is sufficient to eliminate all soil corrosion..

These tests should be made at a number of points along the line, particularly at the connection to the corrosion eliminator and at the extreme point to which protection is to be carried.

These readings should be repeated for several values of current discharged from the ground electrode.

If sufficient direct current test capacity is available to permit the application of a test current for 24 or 48 hours, before reading the pipe-to-soil potential, the conditions will become more nearly stable and more reliable data will be obtained.

The tests are usually made in the Spring or at the end of the rainy season.

The d.c. potential to be supplied is found by adding:

1. Pipe-to-soil potential, at the eliminator station, with optimum compensating current passing through the eliminator or test battery.
2. Drop of potential in the various leads and connections.
3. Ground electrode and pipe polarization potential having an approximate value of one volt.
4. The back potential is 1.0 volt if a carbon ground is used.[2]
5. The drop of potential at the ground electrode.[3]

All of these values can be readily determined with the exception of the last.

Before installing a pilot pipe or ground electrode, the soil should be sampled at pipe depth to find the resistance of the soil per cubic centimeter. This may be done with Shepard rods in the field or by sending samples of soil to the laboratory.

Frequently a number of locations can be tested in a given vicinity and the one chosen that gives the lowest yearly average resistance.

Horizontal Ground Electrodes

Knowing the soil resistance, the electrode-to-ground resistance can be found by reference to the chart of Fig. 5.

Horizontal ground electrodes are preferably laid in a straight line, at a depth of 5 feet or more, in soil moist throughout the year. Occasionally it is necessary to use shorter lengths and place a number of them in parallel trenches.

In this case the resistance of the ground bed is decreased considerably if the spacing between the parallel pipes is increased up to 100 ground pipe diameters or more. For smaller spacings the

resistance must be multiplied by a spacing factor given on Fig. 11.

The pipes are connected by brazing or welding a 250,000 circular mil, rubber covered cable to two points on each length of cast iron pipe. This system of multiple connections is used to avoid a loss of an appreciable amount of electrode surface, if, near the end of its life, the pilot pipe disintegrates into a number of short lengths.

These copper connections are insulated with asphalt as shown in Figs. 6, 7, 8 and 9. Fig. 10 shows a completed pilot pipe ready for burial.

From previous experience, it has been found that the loss of metal from a pilot pipe, having a steady current discharge, decreases with time.

The value of 18 pounds per ampere year and the curves given by the Bureau of Standards are correct for short duration tests. This has been confirmed in the laboratory.

On a horizontal ground electrode in service, discharging 100 milli-amperes per square foot of surface, the average loss of metal over a 5-year period was 3½ pounds per ampere year, giving a corrosion efficiency of 20 per cent.

Horizontal ground electrodes installed by the Bureau of Tests and Inspection of the Pacific Gas and Electric Co. are designed for a life of 30 years, losing metal at an average rate of 5 pounds per ampere year at 100 milliamperes per square foot of exposed surface. Cast iron is used, giving a convenient, heavy walled, large surface pipe electrode for the purpose.

The horizontal ground electrodes specified for the various size units are given in Table No. 2.

The advantages of this type of ground electrode are:

1. All parts of pilot pipe are connected to surface cable, so that excessive corrosion cannot cause the loss of a large portion of the ground connection.

2. The pipe is laid in moist soil at a uniform depth, so that all parts are equally active throughout the year.

3. If the soil is too dry, salt or fresh water can be turned into one end of the pipe and escaping at the joints will saturate the ground along the entire length of the pilot pipe.

4. Large pipes can be used in machine dug trenches.

5. Horizontal electrodes may be used in shallow soil.

6. A horizontal electrode is placed 5 feet or more below surface so that surface ground can be used for other purposes, such as farming.

7. Two or three shallow excavations will permit the examination of the pipe at points along its entire length to determine its condition.

8. Entire length of ground electrode can be easily salted or watered from time to time, if a lower resistance is desired.

Vertical Ground Electrodes

Vertical ground electrodes require the same kind of preliminary exploration as that required for the horizontal ground electrodes.

Samples of soil are taken at uniform intervals between the surface and the bottom of the proposed rod. The specific resistance is then determined for each depth and the specific resistance of the typical soil for use on the chart of Fig. 11 is found from the following approximate formula:

$$R_{sp} = \frac{n}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots + \frac{1}{R_n}}$$

R_{sp} = specific resistance of typical soil for location tested

n = number of samples at "n" depth

R_1, R_2, R_3, etc. = specific resistance ohms per c.c. of samples taken at depths 1, 2, 3, ... and n.

When a number of vertical electrodes are connected in parallel, the upper ends are connected by a rubber-covered cable, usually placed about a foot below the surface. When an iron pipe is used for a ground rod the cable is brazed or welded in place. If the rod is made of carbon, the cable is inserted in a cavity drilled in the upper end and held in place with clamps or type metal. The connection is then boxed in and the box filled with tar or asphalt.

Vertical ground connections in which a drilled hole is filled with coke,[4] will have a higher resistance than the pipe grounds due to point contact only between the different particles.

The advantages of a vertical ground electrode are:

1. If electrodes are of small diameter and soil is reasonably free of boulders and of sufficient depth, they are easily installed.

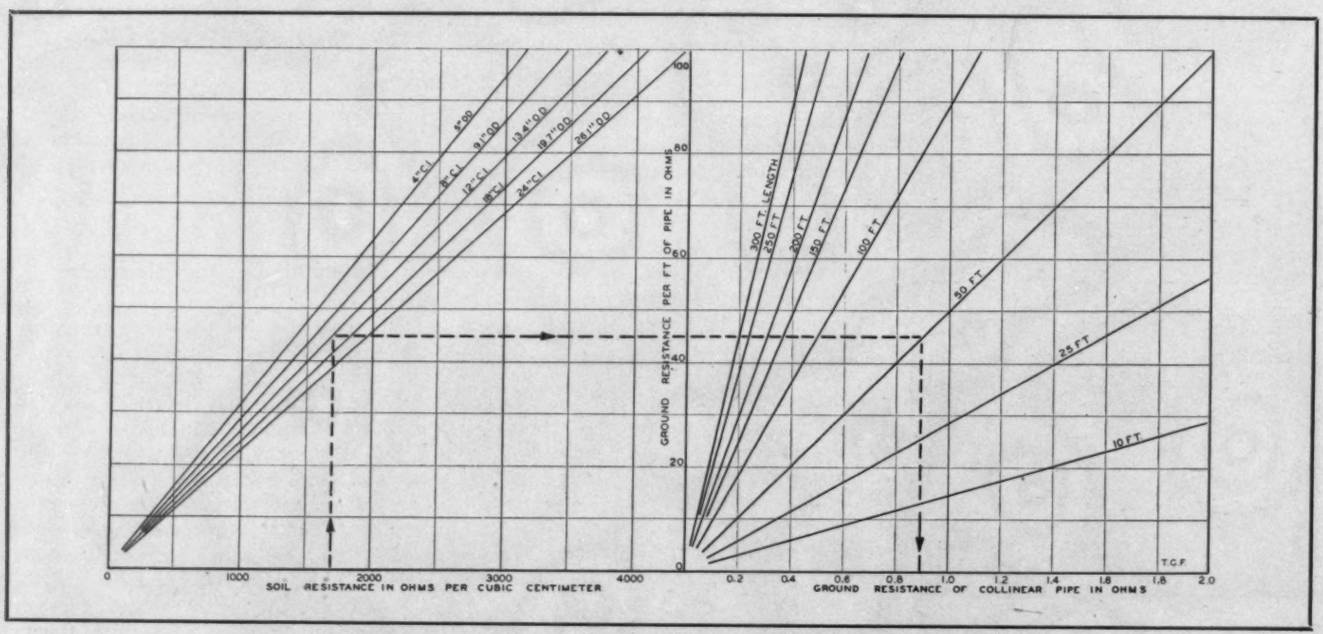


FIG. 5. RESISTANCE OF HORIZONTAL GROUND ELECTRODES.

FIG. 6. Copper cable connection to horizontal pipe ground electrode—(brazed).

FIG. 7. Copper cable connection to horizontal pipe—(primed).

FIG. 8. Copper cable connection to horizontal pipe ground electrode in box for asphalt sealing compound.

FIG. 9. Copper cable connection to horizontal pipe—(sealed).

FIG. 10. Horizontal ground electrode connected and ready for installation.

2. Vertical rods can be driven in marsh land in which pumps would be required in the digging of a horizontal trench.

The disadvantages are:

1. During part of the year only a portion of the rod may be in wet soil. This will cause a heavy concentration of current and consequently intense corrosion of that portion of the rod and drying out of the soil around it. A number of these installations coming to the writer's attention have permanently increased in resistance from a few tenths to several ohms.

2. Due to the position and depth of the rods, it is not practicable to excavate them for the purpose of examining either the rod or the soil.

3. If placed in farm land the tops of the electrodes and cables must be buried deep enough to permit the use of the ground or the land must be purchased outright.

Location of Ground Electrodes

Ground electrodes, whether horizontal or vertical, should be placed at a distance of not less than 50 times the ground pipe or electrode diameter from the pipe to be protected.

If the horizontal ground electrode is placed in any other position than parallel to the pipeline, no portion should be placed closer than 50 diameters.

On the other hand there is little to be gained electrically by increasing this distance beyond 50 diameters.

Summary

Improvements made by the Bureau of Tests and Inspection of the Pacific Gas and Electric Co. in the equipment used in the electrical protection of pipes are summarized as follows:

1. Standard equipment and standard methods of installation have been developed for the electrical protection of pipelines.

2. Size of the electrical equipment has been reduced to 1/30 of the volume of that used on the original installations in 1930, and the weight has been reduced to less than 1/10 of the weight of the first electrical units. This permits

(Continued on Page 42)

Gas Repressuring in Eastern Kansas

● **N. M. HUTCHINSON, Production Engineer, Empire Oil and Refining Co., El Dorado, Kansas; addressing Natural Gas Department, American Gas Association, Dallas, Texas, May 5-8, 1936—(Abstract by G A S).**

THE term "air or gas" drive is applied to the operation of returning to the well excess gas not used for fuel, or the injection of air, where no attempt is made to increase the then formation pressures; repressuring refers generally to those operations involving the partial restoration of original formation pressures by the use of outside gas.

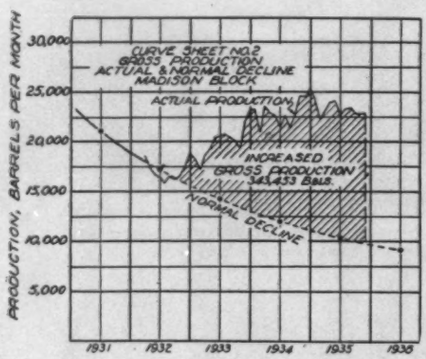


FIG. 1.

The area discussed comprises approximately 1,150 productive areas, of which 980 acres are under repressuring. Bartlesville sand production is found at depths of 1,850 to 1,900 feet.

The average sand thickness is 40 feet of which 20 feet is "pay." This sand has medium fine grains, well cemented with a porosity of approximately 18 per cent. It might be classed as medium hard by those drilling it.

Repressuring using the air drive was started in October, 1927 on five leases, on which development had been completed, using five injection wells, all of them being "five spot" locations. Air at the rate of approximately 50 M c.f. per day was injected into each well.

In March, 1928, five months after starting the "air drive" it was necessary to change to gas. There were several reasons for this: Corrosion of tubing and oil well pump parts became evident; oil emulsions increased; the continued use of air would soon dilute the gas, destroying its value as fuel for operations; the advantage gained by the use of gas instead of air in reducing the viscosity and surface tension of the oil would be of material value in the greater ultimate recovery.

During the period of March, 1930 to April, 1932, production declined from 930 barrels per day to 600 barrels per day. During a greater part of this period five and six injection wells were alternated in periods of 30 to 60 days. As gas channeled to producing wells, requiring the application of back pressure, a switch of key wells would be made to another group. Results from the air or gas drive during the period 1927 to 1932 were good only in so far as it retarded the decline. Some leases during this period showed an increase in production. However, too little energy was being added to the sand in comparison to the amount of gas being removed, and that which had already been withdrawn. Therefore, in March, 1932, large quantities of natural gas were applied to the block in general, affecting 12 leases with 13 key wells.

Referring to Fig. 1, the progress of production will be noted. The production of oil fell below the normal decline for six months. This was probably due to injecting too large volumes of gas to the five spot injection wells, resulting in back pressures on oil wells adjacent to them. The back pressures when applied, reduced the oil production. Production started to increase from the "low" established the fourth month after introducing large quantities of gas to the sand. After the sixth month, the production reached a point above the normal decline and has shown very substantial increases since.

There has been a total of 3,500 cu.ft. of outside gas injected to the sand per net barrel of increased production, of which 63 per cent still remains in the sand and is available for producing oil.

Should the use of outside gas be discontinued at this time, the amount "stored" in the sand, 652,965 M, would be sufficient to operate the project for over six years. This time is determined by assuming that all gas not returned to the sand would be used for operations. Oil production will depend on the rate of recycling.

Should outside gas be continued, and based on experience on other projects which have established a sufficient decline so as to forecast an ultimate production, it is estimated that the recovery under normal conditions can be increased 45 per cent, giving an increased recovery due to repressuring of 2,880 barrels per acre and a total ultimate production of 9,280 barrels per acre.

How Much Free Appliance Service?

● **H. W. GEYER, Southern Counties Gas Co., Los Angeles, Calif.; addressing Annual Meeting, Natural Gas Department, American Gas Association, Dallas, Texas, May 5-8, 1936—(Abstract by G A S).**

WITHIN the past several years a number of marked innovations have appeared on the appliance market which call for a reexamination of our knowledge of theory, service practice, and policies. Indications are that changes in consumer taste, increased competition between appliance manufacturers and between competing fuels, and more discriminating choice on the part of appliance dealers and merchandising gas companies will accelerate these changes in design and construction. This calls for a flexible mental attitude to keep abreast and even ahead of developments.

A large proportion of service problems starts with the sale of an appliance. Therefore, it seems logical to begin at that point.

All appliances considered for inclusion in the merchandising program of the Southern Counties Gas Co. must first have A.G.A. laboratory approval. When a new appliance is presented by a manufacturer, it is sent to the gas company laboratory for examination and testing. This does not involve duplication of A.G.A. tests, but is done for the purpose of determining its operating characteristics, maximum capacity, possible advisability of using fixed orifices, and various points of interest to the sales and service departments.

A.G.A. approval signifies compliance with *minimum* standards of construction and operation, but laboratory examination will often show a large difference in appliance performance. Among gas ranges, for example, some may be found which can be operated safely with oven burner inputs up to 100 per cent in excess of the minimum required for A.G.A. approval. This means a marked increase in speed and corresponding decrease in time. It is felt that the full capacity of an appliance should be utilized, and appliances with superior operating characteristics given preference in merchandising. Many valuable details are determined during this laboratory test, and such instructions as may be found necessary are then issued to the field men.

Before any range or refrigerator is permitted to leave the warehouse for installation, it must first be connected to gas and completely examined and adjusted. *(Continued on Page 28)*

RUUD

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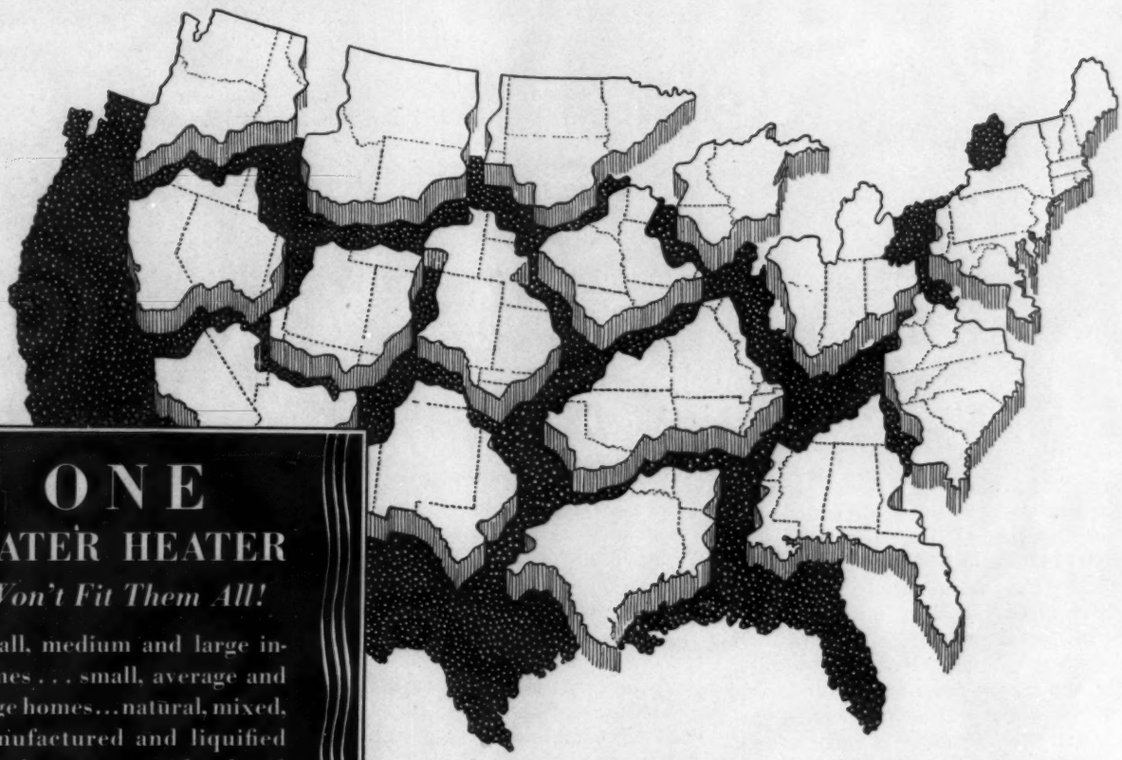

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LOW PRICED NEW MODELS

Gas ranges are examined for defects in porcelain enamel, defective parts, or construction. All burners are adjusted at standard service pressure for the inputs determined by the laboratory acceptance test. On some of the newer ranges it has been found advisable to substitute fixed orifices for the adjustable type provided on top burners and separate broiler burners. Oven thermostats are checked for calibration, safety pilot valves are timed to see if their setting is within allowable limits, and all tube compression joints are soap tested for leakage.

Gas refrigerators have a fixed orifice installed in the burner and a gas pressure regulator mounted in the unit compartment. The gas pressure is then checked at the burner orifice and the box operated for at least 24 hours to check general performance and the setting of the temperature control. Whenever possible the box is delivered and installed while still cold, but during the summer when sales mount rapidly, boxes are often set up and tested some time prior to the expected sale, then set aside pending sale and delivery.

Experience indicates that this practice insures a minimum of time spent in the consumer's kitchen by the installation crew.

Standard installation practice calls for a gas cock ahead of the union connection at each appliance. This also applies to installations made by dealers who operate under the sales program. The extra time required during a service call to turn off gas at the meter and later turn it on, to relight all pilots, and to check other appliances (particularly annoying to the consumer during the heating season) will cost as much as the gas cock during the initial installation.

Every company sale must be followed up by the salesman to insure satisfactory understanding of the appliance and its operation. On clock-controlled ranges a home service girl must also call and give instruction in the proper adjustment and usage of the automatic clock. When a family buys an oven-controlled range to replace one without oven control, a home service girl also calls and explains the setting of the control. On refrigerators, because of the delayed nature of its operation, a service man calls within 48 hours of its installation to make a final temperature check and answer such questions as the consumer may have.

The following features should be carefully explained to new owners who previously did not use an appliance equipped with them:

Gas Ranges: Oven controls, clock controls, safety pilot valves, and relighting of safety pilots or safety burners.

Gas Refrigerators: Relighting of safety burner, defrosting, cleaning of gas burner and burner screen, and expiration of the warranty.

Gas Water Heaters: Relighting of safety pilot, "Customer Control" burners, thermostat setting, and high temperature gas shut-off valve.

The following recommendations are made:

1. Close cooperation should exist between sales and service departments if the volume of service is to be kept within reasonable limits during and after intensive sales drives.
2. Gas company employees charged with receiving routine service requests should preferably be experienced in field service work.
3. The consumer's kitchen should not be used as training ground for service men.
4. A proper selection and training of service men is necessary.
5. An adequate tool kit plays an important part in the equipment of service men.
6. A firm attitude should be taken when answering obviously unjustified service calls.
7. Proper service records should be kept of calls and work done so that changing trends in service costs may be accounted for.
8. Service should include only such work as may be necessary to keep appliances in good operating condition, and definitely demonstrate the superior advantages of gas over competing fuels.
9. A central control over complaints and service requests received should be maintained.
10. Appliance dealers should be educated in proper service procedure and a better application of correct adjustment and application of gas appliances.

Brake Horsepower Analysis of Compressor Station Operation

● **D. R. CROFT, Ohio Fuel Gas Co., Columbus, Ohio, and G. S. YOUNG, United Fuel Gas Co., Charlestown, W. Va.; addressing Natural Gas Department, American Gas Association, Dallas, Texas, May 5-8—(Abstract by GAS).**

SINCE a compressor station is essentially a power plant, its operation must be analyzed from the standpoint of the efficiency and economy with which it develops and applies power. In making an analysis of this type, it is necessary that unit cost be placed on a work basis rather than a volume basis such as cubic feet of gas delivered. Generally, in compressor stations, the power unit used is the horsepower and the corresponding work unit is the horsepower-hour.

The use of the horsepower-hour as a basis of compressor station unit costs makes possible an accurate and true analysis of operations and the comparison of one station with another provided proper corrections are made for differences in load factor.

The preparation of a compressor station cost analysis, using the B. H. P. Hour as the cost unit, presents two major factors for consideration:

1. Determination of a practical and accurate method of measuring the B. H. P. hours developed.
2. Presentation of the unit costs in a comparable form in order that the major items of compressor station operation may be analyzed and studied.

Determining B.H.P. Hour Output

The basic formula for indicated horsepower per million feet of gas compressed per 24 hours is:

$$\frac{\frac{\text{m.e.p.}\,LAN}{33{,}000}}{\frac{1440\,ALN\,T_o\,P_1\,E_{1v}}{1{,}000{,}000 \times 144\,T_1\,P_o}}$$

which simplified becomes:

$$\frac{100 \times P_o \times T_1 \times \text{mep}}{33\,P_1 \times T_o \times E_{1v}} \qquad (1)$$

where

P_o = Absolute base pressure in lbs. per sq. in.
T_1 = Absolute initial temperature in degrees F.
mep = Mean effective pressure in lbs. per sq. in.
P_1 = Absolute intake pressure in lbs per sq. in.
T_o = Absolute base temperature in degrees F.
E_{1v} = Isothermal volumetric efficiency.

Evaluating the preceding items:

P_o = 14.9 lbs. per sq. in. (14.4 lbs. atmospheric pressure plus 8 oz. accepted as standard measuring pressure).
$T_1 = T_o$ (where $T_o = 519.6°$ F.).
mep = T_o (0.15 plus 2.3 log R) which is Mr. Weymouth's empirical formula for m.e.p. where R = Ratio of Compression.
P_1 = Absolute suction pressure.
$E_v = 1 - C_1 (R - 1) - S$; 6% Clearance (CL) and 3% slippage (S) were selected as average values, or
$E_v = 1 - .06 (R - 1) - .03 = .97 - .06 (R - 1)$.

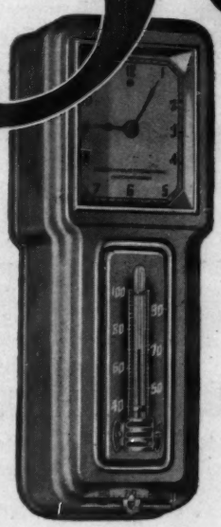
Susbtituting the above values in equation (1) and simplifying, the formula for indicated horsepower per million cubic feet of gas compressed per 24 hours becomes:

(Continued on Page 30)

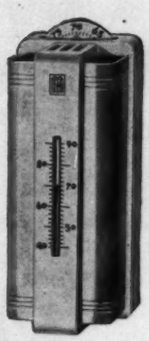
Series 10

A FUNDAMENTAL CIRCUIT EXCLUSIVE WITH

Minneapolis-Honeywell



Chronotherm



Acratherm

Air Conditioning Furnacestat

THE exclusive Series 10 Circuit is the basis for the inherent accuracy and proved performance of Minneapolis-Honeywell Controls. It is a fundamental circuit for primary controls and also allows complete co-ordination of every automatic heating or complete air conditioning function. Only Minneapolis-Honeywell offers the Series 10 Circuit and only the Series 10 Circuit offers the flexibility of application and all around performance necessary to proper and economical control. Minneapolis-Honeywell Regulator Company, 401 E. 28th Street, Minneapolis, Minnesota. Branches everywhere.

■

Dependable Controls Cost Less Than Service

MINNEAPOLIS-HONEYWELL

Control Systems

BROWN INSTRUMENTS, FOR INDICATING, RECORDING AND CONTROLLING

STATION	B. H. P. Hours	Load Factor	Fuel per B. H. P. Hour	Equiv. 1,000 B. T. U. Fuel	B. H. P. per M. C. F. Del.	COST—CENTS PER B. H. P. HOUR												
						OPERATION							MAINTENANCE			SUMMARY		
						Labor	Labor 50% L. F.	Fuel	M. & E.	Lub. Oil	Total	Total 50% L. F.	Labor	M. & E.	Total	Total Labor	Total Labor 50% L. F.	Total All Accts.	Total All Accts. 50% L. F.

FIG. 1. B. P. H. Hour cost report form.

$$\frac{6.77 + 103.83 \log R}{.97 - .06 (R - 1)} \qquad (2)$$

A mechanical efficiency of 95% and a compressor efficiency of 90%, or a combined mechanical and compressor efficiency of .855, were selected as average conditions throughout our system.

Converting indicated horsepower into brake horsepower by dividing formula (2) by the combined mechanical and compressor efficiencies (.855) gives the formula for B.H.P. per million cubic feet of gas compressed.

Multiplying this formula by 24 hours and dividing by 1,000—the formula for B. H. P. hours per 1,000 cubic feet of gas compressed becomes:

$$\frac{.16248 + 2.4919 \log R}{.829 - .05 (R - 1)} \qquad (3)$$

After solving this formula (3) for various ratios of compression (R), a tabulation may be made, showing B. H. P. Hours per M c.f. gas delivered for various values of R. When the average suction and discharge pressures are known for an operating period, the ratio of compression may be determined and the B. H. P. Hours per M c.f. for this condition may be read from the tabulation.

An alignment chart can be constructed from which the ratio of compression may be determined.

The formula for gas compressed in cubic feet per revolution for any given compressor is:

$$\frac{P.D. \times E_{iv} \times P_i}{P_o} \qquad (4)$$

where:

P.D. = Piston displacement in cu.ft. per revolution = average effective area of the compressor cylinder in sq.ft. multiplied by twice the length of stroke in feet.

E_{iv} = Isothermal Volumetric Efficiency = 1 — .06 (R — 1) — .03. Substituting for E_{iv} and P_o, the formula for cubic feet of gas compressed per revolution is:

$$\frac{14.9}{P.D.} (1.03 P_1 - .06 P_2) \qquad (5)$$

From the above formula an alignment chart can be constructed for each compressor, from which the cubic feet of gas pumped per revolution can be determined. This value multiplied by the total revolutions for a given period and divided by 1,000 (changing from cu.ft. to M c.f.) will give the total M c.f. gas compressed during the period, which multiplied by the B. H. P. Hours per M c.f. for a given ratio of compression equals the total B. H. P. Hours developed during the period.

Fig. 1 shows the form used for the horsepower-hour cost report. The first five items in this report are statistics compiled from station operating reports. The balance of the report is a cost analysis using the brake horsepower hour as the basis for unit cost.

A New Approach to the Sale of Gas House Heating Equipment

● C. K. PATTON, the Dallas Gas Company, Dallas, Texas; addressing Annual Meeting, Natural Gas Department, American Gas Association, Dallas, Texas, May 5-8, 1936—(Abstract by GAS).

IN the period prior to the fall of 1935 the Dallas Gas Co. was faced with the problem of retaining and augmenting house heating gas sales. The problem had been approached from the standpoint of the equipment itself, but in spite of improved types of appliances and all available means of sales effort and advertising, ground was being lost not only in gross sales but also in customer relations and acceptance. This was thought to be largely a result of customer use of inadequate equipment purchased and installed several years before.

C. K. PATTON

It was then decided to build the heating program around the idea of combating the common cold germ, "Public Health Enemy No. 1," and the slogan was adopted of "Guard Your Health—It Is Your Most Precious Possession." This was followed through the Sales Department with the slogan, "Heat Your Entire House for Your Health's Sake."

The Advertising Department prepared a booklet built around this idea. This booklet features first, the importance of one's health and how it was being undermined through inadequate and improper heating, using vital statistics which were obtained through considerable research, time and effort; then followed proper recommendations as to ventilation and heating of the home from the health angle. Health protection was the outstanding motive factor in this entire booklet and all the copy was designed to arouse the customer's interest in guarding that most important asset. Equipment was left out of all ads.

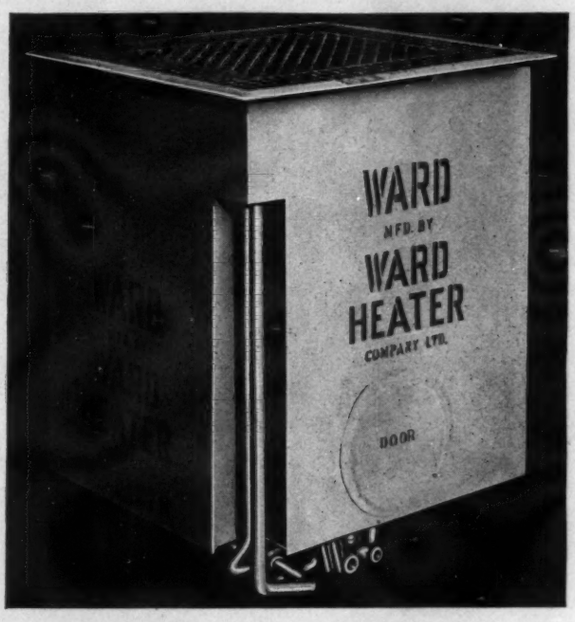
In presenting this thought of developing heating load through the health idea, it is not the purpose to suggest that it is a substitute for the active promotion of better and improved heating equipment. There is no substitute for this. However, it is a proper and better vehicle to use in this promotion because first, it is a real service to customers to direct attention to the highly important effect of proper heating on the family health; secondly, it has a definite tendency to encourage the increased use of the present equipment which the customer now owns and, finally, it arouses an increased interest in his heating problem, thereby causing him to give greater consideration to the improvement of his existing heating equipment. This, of course, paves the way for the greater sale of improved heating equipment. This kind of a promotional program seems to have the desired public acceptance. Never before was there more complimentary editorial comment from newspapers on a gas company activity; never before more widespread customer comment on this subject, and with it all, and perhaps best of all, less customer complaint because of high bills during one of the most consistently cold winters ever experienced in this territory.

The following recommendations are made for consideration on the part of

A PERMANENT LOAD BUILDER

INCREASE YOUR PRESENT LOAD...PROTECT YOUR FUTURE LOAD

WITH HEATING EQUIPMENT THAT "STAYS PUT!"



When you hook a WARD FLOOR FURNACE to your gas line... you add a load that is good for years. WARDS are *permanent* equipment ...once in they stay put. Guaranteed ten years... built for a lifetime! ★ Consumers who enjoy the efficient, circulated, vented warmth of a WARD FLOOR FURNACE aren't interested in blandishments about other fuels or other appliances. Their heating problems are over. Three hundred thousand installations in homes, churches, hospitals and other public buildings prove WARD merit and popularity. ★ This is one reason why alert gas company merchandisers are adding WARDS to their "sales staffs"... putting these efficient, vented heating appliances to work building present load, protecting future load.

We'll be glad to give you the whole WARD FLOOR FURNACE story . . . what they have done in in other communities . . . what they can do in yours. Just ask us.

Exclusive WARD FEATURES

The WARD FLOOR FURNACE is built in one compact, "complete package." Installation is simple... just drop it in the floor, connect to your gas line, and it is ready to go to work. Experienced gas fitter can have a WARD installed without muss or fuss in half a day.

★

Exclusive WARD features include:

FLAME FENDER which prevents burning out ... adds years to the life of the furnace.

BILT-IN THERMO-CONTROL... the most accurate thermostat developed for floor furnaces. It is part of the furnace, no expensive wiring necessary.

AUTOMATIC PILOT... a WARD perfected safety device that is dependable and sure.

CRADLE CIRCULATOR... an "air conditioning" feature which insures steady air flow, increases heating efficiency as much as 20%.

STURDY CONSTRUCTION...WARD FLOOR FURNACES are built of 16 and 18 gauge rust resisting TONCAN IRON.

★

WARDS are A.G.A. approved *complete with all appliances in.* No changes, nothing added to models as tested in A. G. A. laboratories.

WARD

FLOOR FURNACE

Manufactured since 1909 by

WARD HEATER COMPANY, LTD.

1800 WEST WASHINGTON BLVD. • LOS ANGELES

WARD REPRESENTATIVES: J. E. Davies, Peoples Gas Bldg., Chicago • A. S. Kincaid, 2012 Harwood Ave., Dallas • F. E. Reilly, 200 Davis St., San Francisco

YOUR LOAD IS AS GOOD AS THE APPLIANCE YOU SELL

the industry in the development of this potential market:

1. This better type of equipment to be built of such material as under normal conditions to insure 10 to 15 years of service without burning out or creating a hazardous condition.

2. Appliances with automatic temperature controls to be so equipped by the manufacturer as a unit and the appliance with its controls to be approved by the American Gas Association as a unit and so listed in the Directory of Approved Gas Appliances.

3. Any automatic controlled piece of heating equipment that is sold equipped with safety pilot to be so constructed as to operate for the life of the heater without the pilot burning out or sticking.

4. Vented heating equipment to have an efficiency of at least 75 per cent.

Northern Illinois Utility Reaches Out for New Industries

By C. H. SCHILDGEN and J. E. FREEMAN

Industrial Development Department, Public Service Company of Northern Illinois*

THE Industrial Development Department of the Public Service Co. of Northern Illinois was established for the purpose of cooperating with manufacturers seeking plant locations. The Department is assisting manufacturers with all phases of their plant location problems by supplying essential information about any community served by the company.

The territory served by this company covers approximately 6,000 square miles and includes over 320 communities in the metropolitan area within a distance of 50 to 100 miles from Chicago. In this area are many communities affording facilities in transportation, availability of raw material, supply of labor, etc., together with an abundant supply of gas and electricity, to meet the requirements of the individual manufacturer, and in order to place such information at his disposal the Industrial Development Department has compiled data on these various industrial communities.

Surveys are made, in cooperation with local civic bodies wherever possible, which have developed information such as a manufacturer would find necessary and desirable in considering possible locations. This includes data on population, local government, taxes, postal facilities, schools, hospitals, transportation, banking, housing facilities, labor supply, water supply and analysis, situation with regard to markets, freight rates, etc.—all this to supplement a record of any buildings available for occupancy or of property suitable for industries desiring to build. The record of available buildings includes such information as floor area, number of stories, details of construction, equipment, location with respect to railroads, etc.; also a photograph and a sketch plan showing the layout of individual buildings.

Thus the manufacturer can have at his disposal a fund of pertinent information particularly useful to him in a careful consideration of possible locations for his plant —in effect, a clearing house for data bearing on industrial location problems.

The Department seeks to cooperate in every possible way with the executives of industries seeking plant locations, as well as with local civic bodies, banks, and real estate operators handling industrial properties, to the end that these industries, if at all possible, may find sites within this company's territory suitable for their requirements.

In this connection, the Department recognizes the advantages of decentralization and the preservation of a proper balance in the distribution of industries so as to maintain diversification insofar as possible. The Department is not only concerned in the development of new industries but is also interested in all factors that will lead to a broadening or expansion of industries already established.

The specialized services of this Department are available without obligation to industries seeking plant locations. The company's interest is solely in the location of substantial industries in communities it is privileged to serve, thus promoting the growth and progress of these communities, as obviously, any growth beneficial to them is also beneficial to the utility company serving them. Among the benefits resulting from such industrial development activities are: More employment, increased sale of gas and power, more business for the local merchants and improved public relations.

To illustrate, the territory served by the Public Service Co. has benefited as a result of 25 new industries locating therein during 1935 and providing gainful employment to over 1,500 people.

* Mr. Schildgen is industrial engineer, and Mr. Freeman, assistant industrial engineer, of the Industrial Development Department, Public Service Co. of Northern Illinois.

Compressor Station Problems in the "Dust Bowl" Area

R. T. POWERS, Texoma Natural Gas Co., Fritch, Texas, in a paper to the Natural Gas Department, American Gas Association, at Dallas, Texas, May 5-8, gave a vivid picture of the dust storms that have ravaged the Southwestern plains for the past several years and have created a major problem in operation of compressor stations.

The "Dust Bowl" area embraces the panhandles of Texas and Oklahoma, western Kansas, southeastern Colorado, northeastern New Mexico and a portion of southwestern Nebraska, roughly 400 miles from north to south and 300 miles from east to west. Prevailing high winds reach a peak intensity in the spring of each year and blow the loosened and denuded earth in dense dust clouds of flour-like consistency that it is almost impossible to exclude from buildings.

There have been numerous occasions when operators in compressor buildings could barely see from one end of an engine to the other even with all available lights burning, and many operators can remember one or more occasions when they could do no more than grope uncertainly around the engines in an almost impenetrable darkness. On unnumbered occasions dust settled in a few hours to a depth of 1/64 inch to 1/32 inch over exposed portions of engines, on foundations and on floors. Due to breathing action the dust entered crank cases, mixing with the bearing oil, completely overloading oil filtering systems, mixing with the oil and being pumped to bearings with harmful effect. One station reported a 2-inch accumulation of mud in crankcases in a few days with a maximum of .104-inch wear on the babbitt of crosshead shoes in five days' time, the oil "feeling like grinding compound."

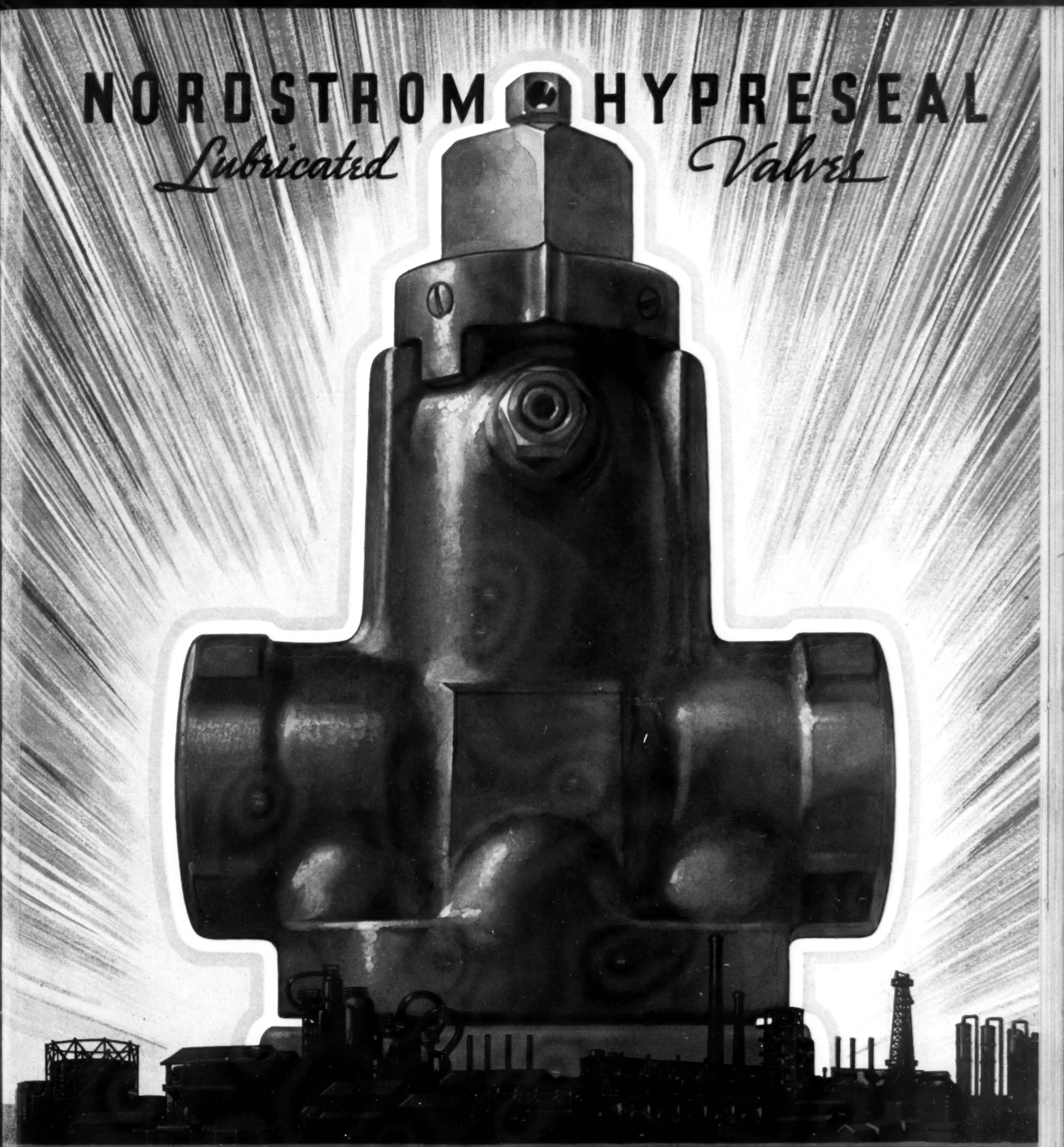
Bearings ran very hot, dust entered lubricating oil supply tanks, oil measures, grease cans and lubricators unless very careful precautions were observed. Valve motions, cams and cam rollers wore to an unusual degree. The windings of open type electric generators and motors became completely clogged with dirt.

Practically all companies have fastened well-fitting canvas covers over the tail guides and openings in the intermediate crosshead guides of the engines and these covers have proven reasonably effective although a tendency to vibrate and "breathe" allows some dust to enter the guides.

To limit the entrance of dust-laden air efforts have so far been directed toward the sealing of many cracks or joints in the building coverings. Some companies have sealed the various lap joints in the corrugated covering, the joints between the covering and the door and window frames and the joints between the flashing and the covering by the use of one or more of the various available plastic calking compounds. Another method has been to solder the longitudinal joints in the corrugated iron, and fill all other joints with strips of oiled felt. The larger spaces have been filled with asbestos fiber moistened with oil and sealed over with the plastic calking compound.

Externally, the dust storms damaged or destroyed paint, ruined automobiles and trucks in a single season, covered up lawns with layers of dust one inch to three inches deep, buried stored equipment, filled up gate and drip boxes, half submerged property line fences and seriously contaminated cooling water systems.

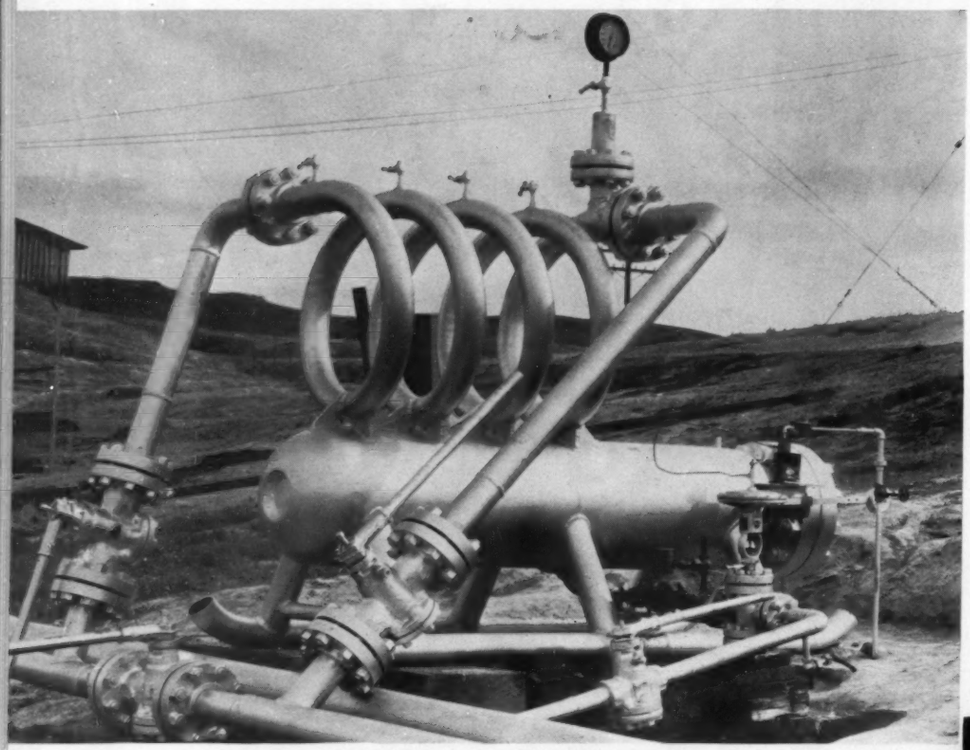
NORDSTROM HYPRESEAL
Lubricated Valves



HYPRESEAL TYPE

The Biggest Factor on the Valve Horizon

THE PERFECT APPLICATION OF A PRINCIPLE



High-pressure mid-west gas trap on gas line carrying 1,100 lbs. pressure, equipped with Nordstrom Hypreseal Lubricated Valves.

A HIGH-PRESSURE VALVE *with NO packing*

•

COMPLETELY SEALED AGAINST LEAKS

•

FOR HIGH-PRESSURE GAS LINES

NORDSTROM HYPRESEAL VALVE

HERETOFORE all forces within a valve have been taken care of by one exterior means. In ordinary high pressure valves the efforts have been greater than existing materials will withstand.

In the perfected Nordstrom Hypreseal Valve *two* exterior means have been provided, thereby dividing the load taken by each one.

The shank which takes a great portion of the load is *threaded* into the valve body. These threads carry the load and are positively sealed by the hydraulic pressure of lubricant.

Sealing of the plug is effected by means of a steel ball adjusted through an *impervious* sealing diaphragm by one single screw.

No packing is required. No leakage can exist. No part of actual plug is at any place exposed to the atmosphere. Full-floating with respect to line pressures.

So rugged has the Hypreseal been made in all details that no field adjustments are normally required. For super valve service, particularly high temperatures and high pressures, the Hypreseal is the solution.

Only Nordstroms Meet Every Major Valve Need

MERCO NORDSTROM VALVE CO. *a subsidiary of* **PITTSBURGH EQUITABLE METER CO.**
Main Offices: Pittsburgh, Penna. Branch Offices: New York City, Buffalo, Philadelphia, Columbia, Memphis, Atlanta, Chicago, Kansas City, Tulsa, Houston, Los Angeles and Oakland.

NORDSTROM VALVES

LUBRICATED PLUG

PATENTED "SEALOPORT" LUBRICATION

"Hot Oil"—New Study of Petroleum Problems

"Hot Oil, the Problem of Petroleum," is a newly published non-technical, 308-page study of the American petroleum industry, of the possibilities of preserving the nation's petroleum supply, and of the question of federal control. It has been written by Samuel B. Pettengill, Democratic Representative from the third district of Indiana, and is published by Economic Forum Co., 51 Pine St., New York, N. Y.

Textual matter and findings, which tend to favor the interstate compact method of promoting orderly production of oil, are based upon the findings of the Cole Committee, which investigated the industry in 1934 and of which the author was a member. An appendix consisting of reports, opinions, and views completes the study.

■ ■

Rate Engineer Named for Iowa Utility

To fill the vacancy created by the death of Charles Dauchy, Iowa Electric Light and Power Co. on May 14 announced the appointment of Herb Henderson as rate engineer. Mr. Henderson will act also as secretary of the Iowa Public Utilities Association.

Mr. Henderson's first schooling in the utility business came through his father, owner of the one-time Henderson Light and Power Co. operating in Jewel, Iowa. An electrical engineering graduate of Iowa State College in 1925, he started his career doing valuation work for the Iowa Electric Co. Prior to his recent appointment Mr. Henderson was with the Iowa Railway and Light Corp. doing property and valuation work in the accounting department.

■ ■

Stockton Well Makes Large Gas Showing

Gas men of northern California are watching with interest tests of the Standard Oil Co. of California McDonald Island Farms No. 1 Well on McDonald Island in the San Joaquin River, 12 miles from Stockton, Calif., that reveal a gas horizon in addition to one that was discovered on April 18. First tests at 4,250 feet showed a production of 8,250,000 cu. ft. of gas daily. The well was deepened to 5,224 feet where it tested 8,500,000 cu. ft. of gas daily. The gas from the lower level is considerably higher in B.t.u. content than the gas from the upper level.

Preparations are now going forward for a further production test.

■ ■

New Fluor Bulletin

The Fluor Corp., Ltd., Los Angeles, has published a new bulletin which contains illustrations, descriptive matter and engineering data on the aerator type cooling tower. The engineering data have been assembled during the past several years from operating records of Fluor towers and are intended to be of help to engineers in determining the size tower required for various needs.

The bulletin carries views of both the standard type and coil type towers together with diagrams of operations, charts showing performance factors and a blueprint detailing installation method of Fluor aerators on existing louvre towers.

"Farewell F. H. A." poster copy used by P. G. and E.

Three-Month "F.H.A. Farewell" Campaign Hits Million Dollar Average

SALES Manager H. M. Crawford's dream of three successive Million Dollar months of merchandise sales, was more than realized in the Pacific Gas and Electric Co.'s "F.H.A. Farewell" campaign.

Anticipating the expiration of Title I of the Federal House Act on March 31, P. G. and E. concentrated all of its promotional sales activities on an intensive effort to sell under F.H.A. terms during January, February, and March. January sales totaled only a little more than $500,000, and the million dollar monthly average seemed pretty remote. However, the January advertising had been devoted chiefly to announcing new reduced electric rates, and virtually no advertising space had been given to F.H.A. sales promotion.

In the latter part of January, Pacific Gas and Electric Co. began its advertising of the "F.H.A. Farewell." Many dealers' meetings were held and dealers were urged to tie in with this advertising. Emphasis was placed upon the advantageous terms available to every householder interested in the installation of gas or electric appliances.

The Pacific Gas and Electric Co.'s own sales force was put into the field with more than usual activity, floor and window displays were built up to emphasize the campaign, and all possible cooperation was given to dealers in every part of the system.

The response was immediate. It was apparent before February was half over that the January total would be greatly exceeded, and reports early in March showed that the February sales volume had reached $1,001,574.16.

The real activity of the campaign, however, came in March. This was, of course, inspired by the knowledge that F.H.A. loans would not apply to all types of appliances after March 31. The March total piled up to $1,648,060.24, making the grand total for the three months of January, February, and March, $3,185,201.51.

This represents only appliance sales financed under F.H.A. Nearly $4,000,000 worth of appliances were sold under other financing arrangements during this period.

Advertising volume during February totaled 37,921 column inches and in March 41,796 column inches, a grand total of 79,717 inches of which 3,343 represents the space used by dealers. The balance was space used by Pacific Gas and Electric Co.

■ ■

Committee to Study New Pressure Piping Code

AT the Spring Technical Conference of the Pacific Coast Gas Association, which was held in Los Angeles, March 26 and 27, there was considerable discussion in regard to the tentative standard code for pressure piping, issued by the American Standards Association under the sponsorship of the American Society of Mechanical Engineers. Parts of this code refer to gas and air piping systems including distribution and transmission lines, and in some instances the provisions of the code conflict with standard practice on the Pacific Coast.

Otto Goldkamp, chairman of the Distribution Committee, Technical Section, appointed a committee to investigate the matter thoroughly and register a protest on behalf of Pacific Coast gas companies. The committee will be under the chairmanship of D. H. Perkins, superintendent of the gas department, San Diego Consolidated Gas and Electric Co., and will include in its membership A. F. Bridge, Southern Counties Gas Co.; Lee Holtz, Southern California Gas Co.; R. S. Fuller, Pacific Gas and Electric Co.; F. F. Doyle, Pacific Gas and Electric Co.; D. B. Larson, Portland Gas and Coke Co.; Roy T. Richards, Central Arizona Light and Power Co.; C. H. Webber, Tucson Gas, Electric Light and Power Co.; W. M. Henderson, Los Angeles Gas and Electric Corp.

■ ■

Carter Assistant Supervisor

W. L. Carter has been named assistant supervisor of the automobile department of the Lone Star Gas System. In the absence of the supervisor Mr. Carter will be in charge of the department.

Cooperative Advertising Project Approved by Indiana Group

ONE of the most successful spring conventions in recent years was held by the Indiana Gas Association at Purdue University, May 20 and 21, with more than 200 delegates in attendance.

With practically every speaker and paper stressing the need for aggressive effort on the part of gas companies to meet competition, the meeting approved unanimously a report of the advertising committee outlining a co-operative advertising program.

Headed by C. V. Sorenson, general sales manager of the Public Service Co. of Indiana, the committee outlined a 12-month advertising program in key newspapers which will blanket the state of Indiana. Copy is being prepared and placed by the Indianapolis office of Bozell and Jacobs, Inc., advertising agency.

The keynote of the convention was sounded by J. N. Shannahan, president of the Public Service Co. of Indiana, at an informal dinner held the first night of the session. Mr. Shannanhan, on the subject of combination company operation, stated that it is economically unsound to permit one phase of the utility business to suffer at the hands of the other, holding that while the problem of the combination property is a difficult one, it can be handled successfully if both branches engage in clean-cut aggressive competition that gives no favors and asks none.

The program included a discussion on "Unaccounted-for Gas," headed by Guy M. Johnson, general gas superintendent of the Northern Indiana Public Service Co.; a paper on "Evansville's Experience Since the Introduction of Natural Gas," read by C. K. Graham, commercial manager of the Southern Indiana Gas and Electric Co.; a paper on "Recapturing the Gas Revenue" read by A. V. Grief, vice-president of the Gary Heat, Light and Water Co., and an address on "Selling Gas Refrigeration" by B. H. Gardner, director of sales of the Columbia Gas and Electric Corp.

L. C. Heavner, of the Fort Wayne office of the Northern Indiana Public Service Co., was elevated to the presidency of the association, succeeding R. N. Zeek, of the Michigan City office of the company. Mr. Heavner served as vice-president last year.

H. C. Wolfe of the Central Indiana Gas Co., Muncie, was elected vice-president and P. A. McLeod, division manager of the Public Service Co. of Indiana at Newcastle, was re-elected secretary-treasurer.

Members of the board of directors are as follows: C. D. Porter, Indianapolis; F. B. Culley, Evansville; D. H. Mitchell, Hammond; C. V. Sorenson, Indianapolis; D. S. Martin, Indianapolis; A. V. Grief, Gary; H. V. Armstrong, Terre Haute; E. E. Linburg, Richmond.

Device to Protect Workmen Against Reckless Drivers

A DEVICE which may shortly be put into use by the Peoples Gas Light and Coke Co. of Chicago to protect workmen from reckless drivers was demonstrated to a group of safety men here last week at the company's warehouse.

The invention of Joseph Misiak of the Peoples company research and testing department, the device is a barricade made of heavy steel with a sturdy base. According to E. J. Hanlon, the company's safety supervisor, the barricade, which stands 3 feet high and is slightly wider than an automobile, is designed to engage the wheels of the car and drag it to a stop without damage. In use, it would be put behind the standard barricades now in use by the company's street department.

Nine of the company's men have been injured in the last three months by drivers who crashed through wooden barricades and struck men working in the ditch, with no chance to escape. It is expected that the new device will eliminate accidents of this kind.

■ ■

Kentucky Natural Laying Montezuma-Terre Haute Line

KENTUCKY NATURAL GAS CORP., Owensboro, Ky., is laying a natural gas transmission line from Montezuma, Ind., to Terre Haute, Ind., contract for construction of the line having been let late in April. The new line consists of 24 miles of 12-inch pipe and will be Linde-welded throughout.

At Montezuma this line takes off from the 20-inch Michigan Gas Transmission Corp. line which is fed, at the Illinois-Indiana state line, by the Panhandle Eastern Pipe Line Co. from the Texas Panhandle fields. Some 60 miles eastward, near Zionsville, Ind., the line that is to supply Detroit with natural gas also taps this 20-inch pipe. From Montezuma the Kentucky Natural Gas Corp. new line runs practically due south, paralleling the Wabash River, to Terre Haute. It is scheduled for completion by July 1.

Terre Haute is at present served manufactured gas by the Indiana Gas Utilities Co.

■ ■

Five United System Men Get Promotions

W. F. Ivers, formerly manager at Jacksonville, Texas, for United Gas Public Service Co., was recently transferred to Beaumont, Texas, as manager of the Beaumont district. He succeeds W. C. Merritt, former Beaumont district manager, who resigned. Mr. Ivers had been in charge of the Jacksonville office for the past four years.

R. M. Nicol, district manager at Schulenburg for the past four years, was advanced to district manager at Jacksonville to fill the vacancy created by Mr. Ivers' promotion. Mr. Nicol was first employed by the company in 1927 at San Antonio.

Ray A. Metzke was advanced from district manager at Harrisburg to district manager at Schulenburg. He has acted for the past four years as district manager at Harrisburg.

To fill the Harrisburg vacancy, C. W. Shroyer was promoted from local manager at Seguin, where he has served for the past year. He has been in the company since 1927.

C. J. Berly, salesman in the Beaumont office, was advanced to local manager at Seguin.

■ ■

Damaged P. G. and E. Main Quickly Repaired

An ambitious but misguided P.W.A. contractor in Oakland, Calif., created news by accidentally driving a pile into one of the gas pipe lines of Pacific Gas and Electric Co. in the early morning hours of April 22. The break occurred close to a pipe line junction at Perry St. and Grand Ave., near Lake Merritt. Workmen cut the line and bagged it off to stop the flow of gas, and replaced the damaged pipe with a new section. First reports reaching the newspapers and given wide publicity were that the break was in the company's main pipe line bringing gas from the Kettleman Hills. The fact is that while it was in a main line serving a small section of the city, prompt adjustment of the valves prevented any serious interruption of service. The damage was quickly repaired and few of the company's customers in the neighborhood knew that there had been any interruption of service whatever.

■ ■

Special "Flood" Issue

The April edition of "Public Service," employee publication of the Philadelphia Co. and its subsidiary and affiliated companies, was a 48-page special "flood" issue. By picture and description this issue tells an effective story of the recent emergency in Pittsburgh, and of the men and women of these companies who at great personal sacrifice performed their duties amidst trying conditions.

BARBER BURNERS Give ANY Gas Appliance a Selling Advantage—

The BURNER *is the Heart of the Appliance!*

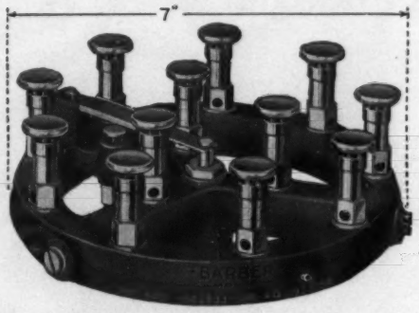
Leading manufacturers of Gas-burning Appliances OF EVERY DESCRIPTION are now turning to Barber not only as a source of supply for reliable Burner Units—but for expert engineering advice and co-operation in the correct design of such Units. Many Gas Companies now insist on such Appliances embodying Burners which merit A.G.A. Approval.

●

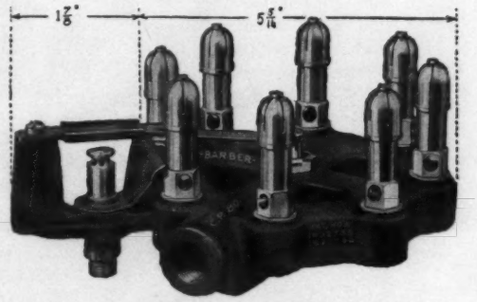
The splendid performance record of Barber Conversion Burners for Water Heaters, Furnaces and Boilers, and numerous other Appliances has been known to the Trade throughout the country for over 18 years. If YOU manufacture, sell, or sponsor Gas Appliances—make use of the exceptional facilities which Barber offers for the development and perfection of YOUR PRODUCT!

●

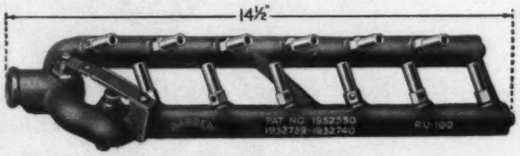
Remember—a Gas-burning Appliance is no better than its Burner! These illustrations represent only a very few of the NEW noiseless Barber Burner Units. If none of these Models is adaptable to YOUR PRODUCT—Barber can and will perfect one to fit the exact requirements in your case. Submit YOUR problem to Barber engineers! The service is free.



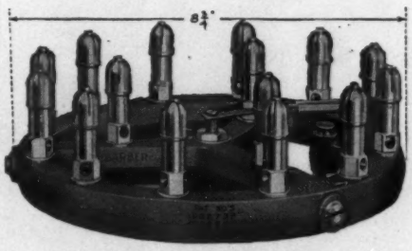
NO. M.P.-12 BURNER



NO. C.P.-80 BURNER



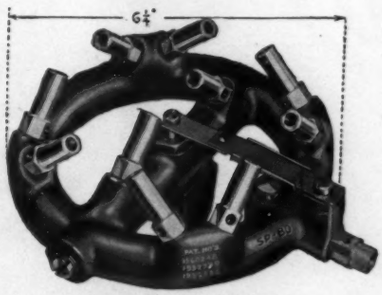
NO. P.U.-100 BURNER



NO. C.P.-150 BURNER

WRITE TODAY
for the New Illustrated Barber Burner Catalog No. 37, with Prices and Discounts.

●

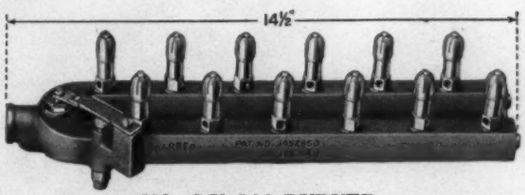


NO. S.P.-80 BURNER

BARBER BURNERS and Regulators Are Adaptable to Such Appliances As:

Air Conditioning Equipment
High Pressure Boilers (Tubular and Tubeless)
Bakery Ovens
Doughnut Kettles
Metal Pots
Garage Heaters
Coffee Urns
Hair Dryers
Space Heaters
Floor Furnaces
Clothes Dryers
Water Heaters
Confectioners' Stoves
Vulcanizing Machines
Pressing Machine Boilers
Japanning Ovens
Core Ovens
Banana Room Heaters and many other Appliances

All Models Furnished With or Without SAFETY PILOT CONTROL



NO. C.U.-100 BURNER

NO. P.U.-160 BURNER

THE BARBER GAS BURNER CO., 3704 Superior Ave., Cleveland, O.

BARBER *Automatic* JET GAS BURNERS

P. G. and E.'s "Bridge the Bay" Campaign

"BRIDGE THE BAY" is the title of a domestic sales campaign launched by the San Francisco Division of the Pacific Gas and Electric Co. on April 2 to run for the balance of the year, according to David N. Reid, domestic appliance supervisor for the San Francisco division. The sales force consists of 32 salesmen, four crew captains, the supervisor, the sales manager and the assistant to the sales manager who acts as statistician in connection with all sales programs.

To record sales as the drive progresses, a reproduction of the San Francisco Bay Bridge, that is now in the final stages of construction and when completed will be the longest bridge in the world, has been drawn to serve as a sales chart (see GAS *Camera,* page 21). Credit is based on revenue produced, and each time a crew produces $1,000 in revenue, a section of steel is placed on its portion of the bridge. Two of the crews start at the center of the bridge and build toward the shores; the other two crews start from the shorelines at either end of the bridge and build toward the center. Individual salesmen's standings are recorded on separate charts called "gang rosters" on each of which the respective crew captain's name appears with the title "construction engineer." These charts indicate the high man for the month as "foreman" of his gang, and the second highest man as "sub-foreman."

On September 4 a get-together dinner, to be called the "Span-the-Gap" dinner, will be held to promote the drive on fall gas heating. A total sum of $500 will be given away during the period of the campaign, the entire amount going to the salesmen in prizes and to pay for the dinner. The prizes are paid monthly, the high man in each crew receiving an award of $10 if he accomplishes quota and the second highest man receiving $2.50 if he accomplished quota.

Midwest Industrial Men Confer

INDUSTRIAL gas men of Illinois, Wisconsin and other midwest states, to the number of 40 or more, gathered at the Palmer House, Chicago, on Friday, May 22, for the annual spring meeting of the Midwest Industrial Gas Sales Council. Porter W. Hay of the Public Service Co. of Northern Illinois at Harvey, Ill., is this year's chairman of the group; George F. Ellis of the LaPorte (Ind.) Gas & Electric Co., is secretary and chairman of the publicity committee.

The morning program featured a discussion by H. C. Weller, Surface Combustion Corp., covering the subjects, "Radiant Tube Furnaces for Vitreous Enameling," and "Controlled Atmospheres."

After luncheon the sessions resumed for an exchange of industrial sales experiences. O. A. Bowen of Peoples Gas Light & Coke Co., Chicago, spoke on "Conversion of Large Boilers for Off Peak Load"; G. H. Head, of Wisconsin Gas & Electric Co., Racine, described "Experiences with Unit Heaters for Industrial Warm Air Heating"; and John Langner, of Northern Indiana Public Service Co., South Bend, took for his topic "Radiant Tubes and Insulating Refractories for Vitreous Enameling." An open forum extending the sales experience discussion concluded the meeting.

Missouri Gas and Electric Reorganization Proposed

MISSOURI Gas and Electric Service Co., Lexington, Mo., has filed a plan for reorganization with the Missouri Public Service Commission. The proposed plan provides for a reduction of interest charges paid by the company from $115,197 to $51,682 annually. Present obligations of the company would be reduced $825,305. A new issue of $1,476,630 in first mortgage bonds and 25,375 shares of common stock would be issued.

The Middle West Corp. owns $224,000 in bonds, 2,000 shares of preferred stock and all of the common stock, together with certain other holdings in Missouri Gas and Electric Service Co. The proposed reorganization plan would cancel all of the Middle West Corp. holdings in the company, in return for which Middle West would receive one share of common stock for each $34,047 represented by notes. This would mean that Middle West would hold one-half of the shares of the stock, and the prior lien and preferred stock holders would hold half. Middle West Corp. and Missouri Gas and Electric Service Co. stockholders would each have three directors on the board with the remaining director to be selected by the federal court.

■ ■

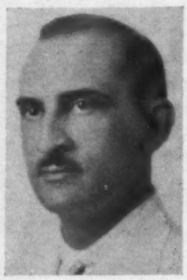
Union Gas and Electric Personnel Changes

A. R. Stryker, superintendent of the East Works of the Union Gas & Electric Co., has resigned his position to assume ownership and management of the Lawrenceburg (Ind.) Gas Co.

Other changes in Union Gas & Electric personnel include the promotion of James P. Stephens from assistant district superintendent in the Distribution Department to superintendent of the East End Works, and of E. A. Fertig from assistant superintendent of the City District to superintendent of the Carthage District. James P. Daratt, formerly with the U. G. I. at Syracuse, N. Y., Janesville, Wisc., Ft. Wayne and Kokomo, Ind., and one time manager of the gas department in Havana, Cuba, is now employed in the company's Distribution Department.

Kuhn Opens Corrosion Consulting Service

ROBERT J. KUHN, formerly electrolysis engineer with New Orleans Public Service, Inc., has opened offices at 1127 Canal Bank Building, New Orleans, as consulting engineer specializing in problems of electrolysis and corrosion of pipe lines and other structures.



ROBERT J. KUHN

Mr. Kuhn attended Tulane University, receiving his B. E. in 1923, his E. E. in 1933. He holds memberships in the American Gas Association, American Institute of Electrical Engineers, the American Petroleum Institute, the American Society of Municipal Engineers, and the Edison Electric Institute.

Known as one of the pioneers in the field of cathodic protection, Mr. Kuhn has contributed notably to the technique of electrolysis and soil corrosion mitigation. His work in New Orleans has involved railway, gas, electric, water, telephone, telegraph and other metallic underground systems.

Mr. Kuhn is the author of many papers in the field of corrosion research, including three contributions to the Bureau of Standards' corrosion meetings. He has acted in a consulting capacity to many companies in addition to his work for New Orleans Public Service.

■ ■

New Financing Program Improves O. N. G. Outlook

CONTINGENT upon the refunding program of Oklahoma Natural which was announced recently, a financial group headed by Stone & Webster, Inc. and associates has agreed to purchase from Central Hanover Bank and Trust Co. the controlling interest which that bank has in Gas Utilities Co., which company in turn has the controlling interest in Oklahoma Natural. Under this plan no one of the purchasers will own as much as 10 per cent of the common stock of Oklahoma Natural.

A refinancing operation will reduce Oklahoma Natural's secured debt by over $2,000,000. Through modification of sinking funds, reduction of interest charges, and provision of adequate working capital the company's position is expected to be improved considerably. No change in name will be made, as was reported at an earlier stage of the refinancing program.

■ ■

Gas Range Sales Increase

Shipments of gas ranges for the first quarter of 1936 increased 32.3 per cent over the corresponding period of 1935, according to C. W. Berghorn, executive secretary of the Association of Gas Appliance & Equipment Manufacturers.

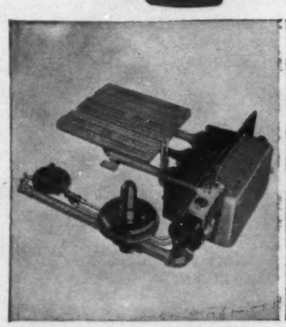
Production of gas ranges also showed a substantial gain for the first quarter, the increase amounting to 27.1 per cent over last year.

Show the line and Reap the Profit

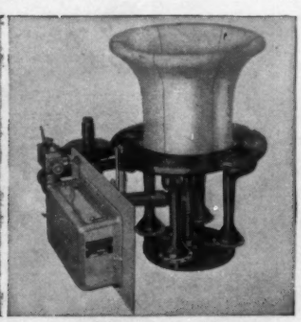
You can please *every* customer when you show the complete line of American Gas Products for heating. There's a boiler or a convertor to suit every taste, every home, every job. For the man who wants a completely new installation — the Ideal Gas Fired Boiler, in whichever of its many sizes suits his requirements. For the man who wants a conversion burner, you've got the convertor tailored to his needs. Here is the line—show it and profit. Each is dependable, efficient, economical to operate. Each is fully automatic, all controls being centered in the AGP Throttling Gas Valve. Each is an item that's easily sold and that *stays* sold. For full particulars and details write today to

AMERICAN GAS PRODUCTS CORPORATION
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
40 WEST 40TH STREET · NEW YORK, N.Y.

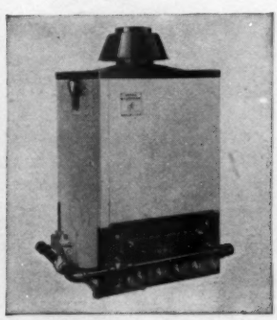
HERE'S THE ANSWER TO EVERY GAS HEATING REQUIREMENT:



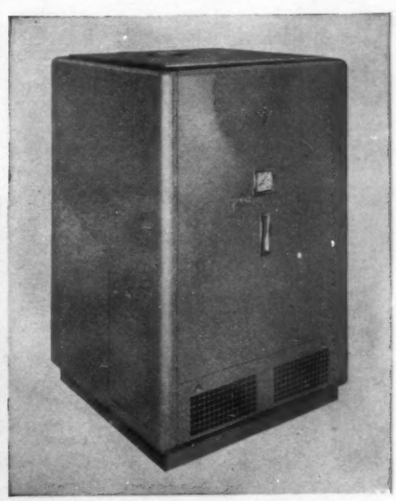
REDFLASH GAS CONVERTOR— Tailor made for the No. 1 series of Arco Redflash and similar boilers.



AMERICAN GAS CONVERTOR combines features never before incorporated as standard equipment in a burner. For Round Boilers.



IDEAL GAS-FIRED BOILER— From the smallest to the world's largest, provide a size and type for every domestic and industrial need.



"EMPIRE" IDEAL—The world's most beautiful gas boiler. No exposed piping; even flue pipe and header in some models come out at the back. All sizes and types.

Brown President Miss. Power & Light

REX I. BROWN, for three and a half years vice-president and general manager of the Mississippi Power & Light Co., has been elected president of the company. To his new office, Mr. Brown brings the experience and training of 27 years in the utility business.

REX I. BROWN

Beginning his career with the Little Rock Railway & Electric Co. as storeroom helper, Mr. Brown was soon advanced to meter inspector, and later became superintendent of the meter department. From this position he went into the commercial department as manager, and 18 years ago became manager of commercial and power sales. Later assuming the management of the Little Rock operations of Arkansas Power & Light Co., Mr. Brown resigned from this position in 1932 to become vice-president and general manager of Mississippi Power & Light Co.

■ ■

American Utilities Service Corp. Consolidates Offices

AMERICAN Utilities Service Corp., of Chicago, has consolidated its Minneapolis, Chicago and Savanna, Ill., offices into one office with headquarters at Savanna, effective May 1. In transferring to Savanna, a central point of operation, the firm will continue to function as a holding company. Offices had been located in Chicago since 1927.

Towns served by subsidiary companies are Charles City and Perry, Iowa; Savanna, Galena and Robinson, Ill.; Elkhorn, Delavan, Lake Geneva, Fontana, Darien, Lyons, Walworth, Williams Bay, and Burlington, Wis.; Calumet, Laurien and Petoskey, Mich.; Yankton, S. D.; Vicksburg, Miss.; Paintsville, Pikeville and Prestonsburg, Ky.

Perry Crawford is president of the company, E. G. Waters, vice-president and Frank O'Neill, treasurer. E. C. Gates has been appointed division general manager of the company at Savanna. George A. Lankie, former division manager, is now vice-president and general manager of the Wisconsin Southern Gas Co., a subsidiary organization at Burlington, Wis.

■ ■

Meat Shrinkage Tests by Natural Gas Bureau

TO determine the relationship of shrinkage to time and temperature of roasting, the Natural Gas Bureau in conjunction with the National Live Stock and Meat Board conducted a series of meat roasting tests during the recent National Restaurant Convention in Los Angeles. Applying particularly to the commercial cooking of meats as done in restaurants, the three tests proved that roasting at temperatures of around 320° instead of the usual 440°, while requiring more time, resulted in improved flavor, less shrinkage, and a great saving in gas used.

In a typical test a roast of 16 lbs. 9 oz. was kept at an average temperature of 310° for four hours and 22 minutes. Evaporation loss was 11.3 per cent and drippings 7.0 per cent. The oven was not preheated, and 53.25 cu. ft. of gas were used. A similar 17 lb. roast kept at a temperature of 449° for three hours and 13 minutes lost 20.4 per cent in evaporation and drippings were 9.9 per cent by weight. Preheating of the oven used 15.5 cu. ft. of gas and roasting 51.15 cu. ft. Use of the low temperature method resulted in a 35.11 per cent saving in gas.

■ ■

Jack Arnold Succumbs to Heart Attack

JACK S. Arnold, residential sales director of the United Gas Public Service Co., Houston, Texas, died on April 26 of a heart attack at the age of 38. Mr. Arnold was in charge of residential sales in the Texas, Mississippi and Louisiana territories of the United Gas System, to which post he was appointed last year. Prior to that he served as sales manager of the Central Arizona Light and Power Co. for a period of 10 years.

JACK S. ARNOLD

Mr. Arnold was born in Wilkes Barre, Pa., and received his education in England, New England and California. During the War he saw service overseas with the U. S. infantry and was wounded in action. Before he began sales work, Mr. Arnold was a commercial artist in Chicago.

■ ■

Deming Laying Natural Gas Municipal System

Construction of a municipal natural gas distribution system in Deming, N. M., was begun in the latter part of April and is scheduled for completion in July or early August. The system will be supplied from a 4-inch extension about 3 miles long which was laid some five years ago from the Western Gas Co. 12-inch carrier to serve the Deming Ice & Electric Co. Intermediate low pressure of 5 to 8 pounds will be served through 4- and 2-inch mains. The town has a population of about 3,400.

Cost of construction is $40,000, of which $22,000 was raised through a revenue bond issue and $18,000 through a PWA grant.

■ ■

New Water Gas Plant for Key City Gas Co.

The Key City Gas Co., Dubuque, Iowa, has under construction a water gas plant that is to have an annual capacity of about 440,000,000 cu. ft., according to Chas. McLean, manager. United Gas Improvement Co., Philadelphia, is doing the actual construction and expects to have the plant ready for operation about September 15.

The water gas plant is going up next to the Key City Gas Co. coal gas plant which was erected by U.G.I. nine years ago. The new plant, the capacity of which is somewhat greater than that of the coal gas plant, will be used for relief and to supplement the output of the coal plant in times of maximum demand.

One of the ovens of the coal gas plant is now undergoing repairs and a small water gas set on another location is carrying its load. When the new water gas plant is completed, the remaining coal ovens will be overhauled also.

■ ■

Newspaper Mat Service on Home Appliances

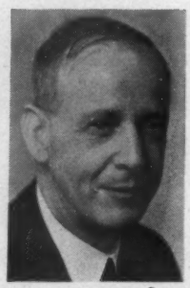
To supply dealers with illustrations of home furnishings and appliances sold in the West for use in their newspaper advertising, Westmat Service has been organized with headquarters in the Western Furniture Exchange, 180 New Montgomery Street, San Francisco.

The service will cover 11 Western States, the Hawaiian Islands and Alaska, served by approximately 225 daily newspapers, all of which will be supplied with mats, available for use of all dealers. The service is designed to familiarize the advertising departments of newspapers with products so that they are in a better position to give effective merchandising aid to dealers. A bulletin on style trends and merchandising aids is also planned for newspapers and dealers.

■ ■

Joseph Bowes President of Oklahoma Natural

JOSEPH BOWES, associated since 1909 with Stone & Webster, Inc., in the management of public utility properties, was elected president of Oklahoma Natural Gas Co., on May 26, succeeding Robert W. Hendee. Mr. Hendee, as reported elsewhere in this issue, has joined the Colorado Interstate Gas Co. in an executive capacity.



JOSEPH BOWES

Mr. Bowes was born in Washington, D. C. in 1885, received his early education in that city and in Baltimore and was graduated from Cornell University in 1907 with degrees in electrical and mechanical engineering. After two years with the Baltimore and Ohio Railroad and Postal Telegraph Co., Mr. Bowes joined the Stone & Webster organization with which his advancement has been rapid. Since 1916, he has held executive positions in gas, electric, transportation and water companies including Puget Sound Power & Light Co., Gulf States Utilities Co., El Paso Electric Co. and Virginia Electric & Power Co. His most recent work has been as president of the Western Public Service Co., which owns a number of properties in Nebraska, Missouri and Kansas.

End Rust Troubles... and Save Mon

with a tank of "lifetime" EVERDUR METAL

COUNTLESS homeowners have had costly experience with rusted hot water tanks. They expected to get clean, rust-free hot water. But instead . after a relatively short period of time . . . they often got discolored water and the expense of rust-repairs.

In every case, a tank of Everdur Metal would have saved money and annoyance. For Everdur (strengthened copper) *cannot* rust. A tank of this sturdy metal assures an abundance of clean, *rust-free* water indefinitely. At the same time, it ends rust-troubles, inconvenience and expense.

Rusting Tanks Waste Money

Regardless of whether you use a range boiler, an automatic heater or a large capacity-heater such as laundries use . . . the problem is the same. Unless the storage tank is of non-rust metal, frequent repairs and replacements are unavoidable. Expense follows expense...and in the end you will have spent more for repairs to a tank of rustable metal than if you had installed an Everdur tank in the first place.

Everdur Tanks Save Money

Everdur is copper, strengthened by the addition of silicon and other elements. Combining the corrosion-resistance of copper with the *strength of steel*, it is only logical that 53 manufacturers of household water heating equipment have standardized on Everdur for non-rust tanks. Your own dealer or plumbing contractor has Everdur equipment or will get it for you. Insist on a water tank of Everdur Metal and end tank expense caused by rust!

● **Laundries and Hotels are eliminating rusty hot water and repair expense with heaters of Everdur Metal.**

ANACONDA

The use of Everdur is not confined to tanks. This versatile, high-strength, corrosion-resistant Anaconda metal is used for countless other purposes throughout all industry.

OTHER DURABLE ANACONDA

ANACONDA 85 RED-BRASS PIPE is the water pipe commercially obtainable COPPER TUBES, installed with Anaco fittings, cost about the same as rustable

For valleys, gutters, rain-pipes and serves as long, as dependably, or as ANACONDA COPPER.

ANACONDA *Economy* COPPER RO time" . . beautifies the home, is and sells at a new low price.

Wide, thin sheets of ANACON COPPER, combined with alte make a more durable type of to damp-proof walls and fou

SCREENS OF ANACONDA rustless and last indefinitely

THE AMERIC
General C
Offices
In Canada: ANACON

Everdur Metal for

Many of your customers have seen this advertisement

in **COLLIER'S,** *issue of* **MAY 9TH** *and*
in **SATURDAY EVENING POST,** *issue of* **MAY 23RD**

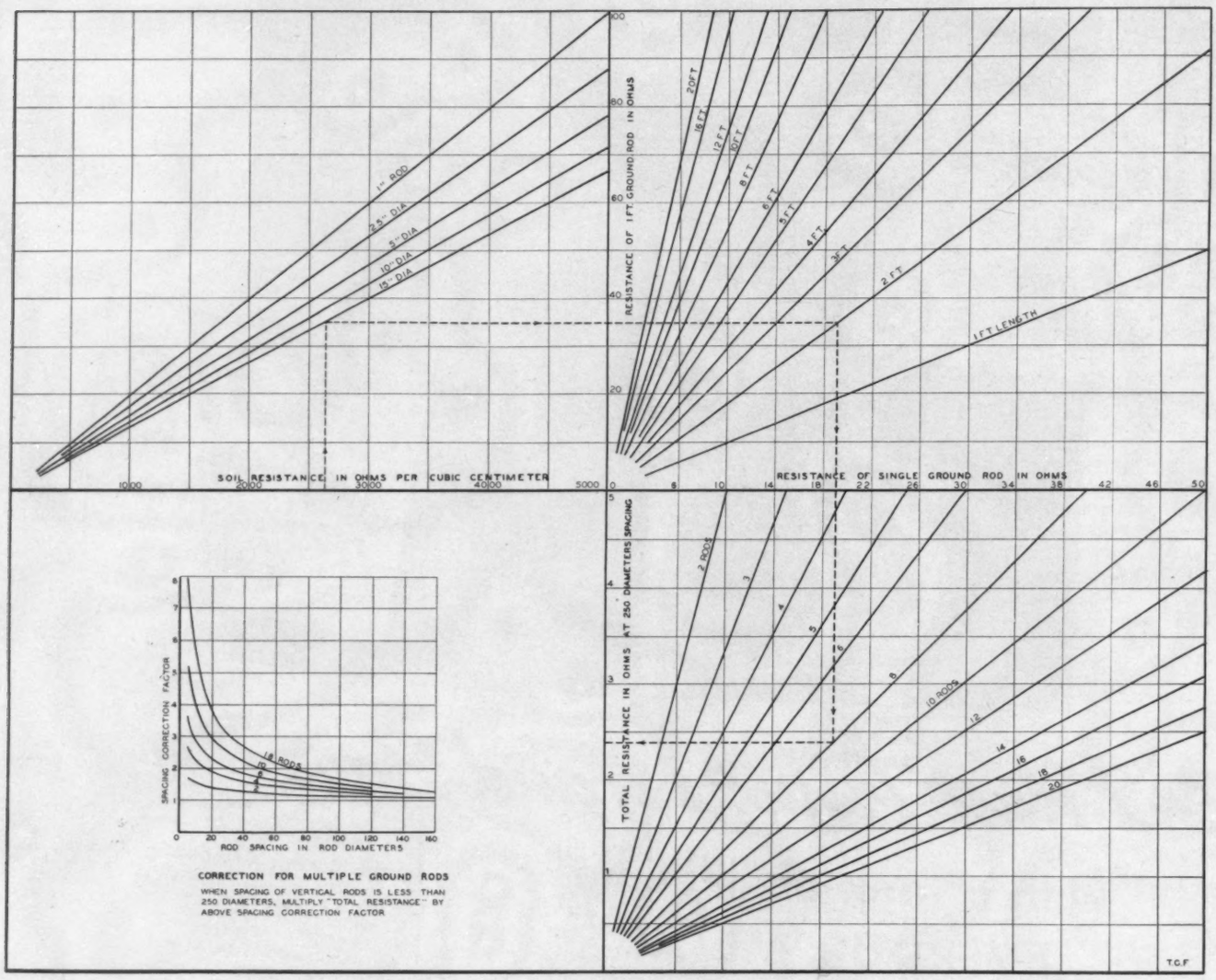

SOIL RESISTANCE IN OHMS PER CUBIC CENTIMETER
RESISTANCE OF 1 FT GROUND ROD IN OHMS
RESISTANCE OF SINGLE GROUND ROD IN OHMS
TOTAL RESISTANCE IN OHMS AT 250 DIAMETERS SPACING
SPACING CORRECTION FACTOR
ROD SPACING IN ROD DIAMETERS
CORRECTION FOR MULTIPLE GROUND RODS
WHEN SPACING OF VERTICAL RODS IS LESS THAN 250 DIAMETERS, MULTIPLY "TOTAL RESISTANCE" BY ABOVE SPACING CORRECTION FACTOR
T.G.F.

FIG. 11. Resistance of vertical ground electrodes.

ELECTRICAL PIPE PROTECTION EQUIPMENT

the mounting of all units on the service poles.

3. The cost of the electrical equipment has been greatly reduced. The present units of the larger sizes cost less than half of those used in 1930.

4. The power consumption has been reduced to one-half by the use of high efficiency units.

5. Maintenance costs have been reduced by the elimination of: (a) All moving parts requiring regular cleaning, oiling and adjustment; (b) all thermostats, relays and other contact devices; (c) The use of long life rectifying units not requiring replacement each year or oftener.

REFERENCES

(Continued from Page 25)

1. Corrosion Mitigation on Gas Lines of Pacific Gas and Electric Company—Proceedings of Pacific Coast Gas Association, 1932, Vol. 23, Page 408.

2. Ground Electrodes for Cathodic Protection Installations—By H. J. Keeling. Proceedings P.C.G.A., 1933, Vol. 24, Page 51.

3. Pilot Grounds for Cathodic Protection of Pipe Lines—By W. R. Schneider. Proceedings P.C.G.A., 1934, Vol. 25, Page 109.

4. Electric Pipe Line Drainage—By G. I. Rhodes. The Electrical Journal, Vol. 33, No. 2, Feb. 1936, Page 93.

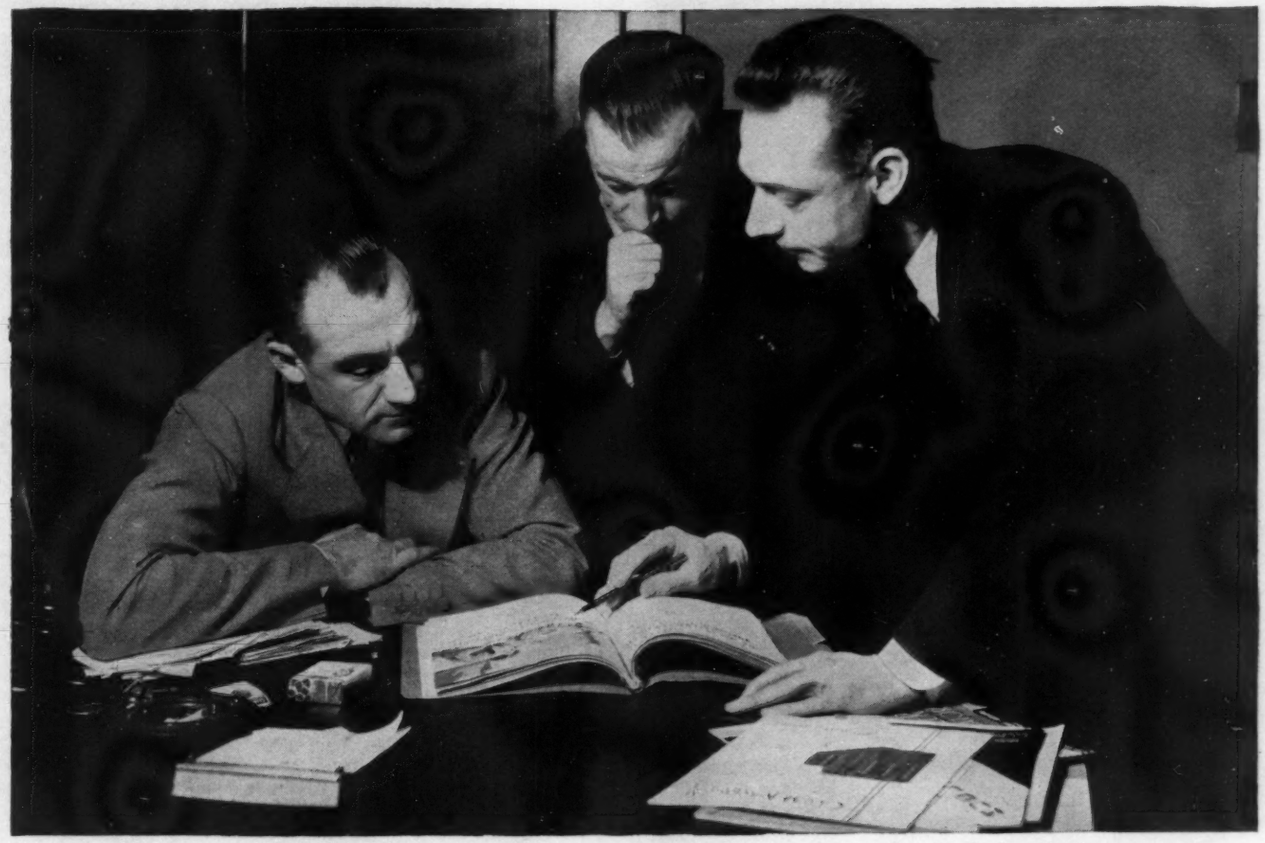
Laboratories to Print Paper Seals of Approval

To increase customer appreciation of American Gas Association approved appliances, the A. G. A. Testing Laboratories will print gummed paper stickers of the Blue Star Seal of Approval to be temporarily pasted in a conspicuous position on all approved appliances. These seals will be furnished to manufacturers by the Laboratories at cost. It is tentatively planned to print large quantities of them in 1-, 1½- and 2-inch sizes. The paper seals are not intended to take the place of the permanent seals, but merely to emphasize the fact of approval to the customer.

■ ■

Funk Moved to Los Angeles

Dawson Funk, for the past year sales representative for the American Stove Co. in its northwest territory, has been moved to Los Angeles in the same capacity. Prior to joining the sales force of American Stove, Mr. Funk was with the Portland (Ore.) Gas and Coke Co. as residential sales representative.



Harold Mueller looks over the year's advertising and sales promotion campaign which Vic Brehm, Mueller advertising manager, has prepared. Jim Shanahan, Mueller's assistant sales manager, looks on.

NOW IS THE TIME TO PROMOTE

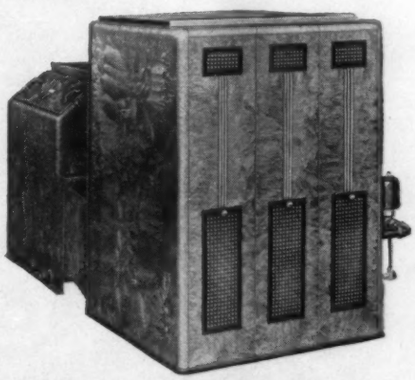
IT has been many a year since conditions have been so favorable for profitable sales promotion. The acute shortage in homes and rising rents are forcing the greatest building activity in years.

If authorities are correct in their estimates that 250,000 new homes will be built this year, you can be sure that your sales effort will pay great returns.

Our folks believe that now is the time to promote and we are ready with a real program. In the first place, we are ready with newly styled Climator equipment, Gas Era Furnaces and Boilers and a great new line of products.

Second, we are launching an enlarged advertising campaign and our advertising department is ready to supply you with literature to help you go after your share of the new business which is piling up.

Third, our field men, all of whom are old-timers at the heating business, will lend you a hand in going after sales in your community. They will help you organize a campaign and will work with you in getting it into operation.



Newly styled Gas Era Furnace gives all the comfort, cleanliness and convenience of fully automatic heat. With Mueller Climator III connected (as illustrated), it provides a winter air conditioning plant for homes. Write for booklet.

Believe me, there will be a lot of furnaces and air conditioning equipment sold this year. The experience we have gained in ten years of pioneering automatic heat and air conditioning has given us a lot of answers to questions that may baffle you. And our answers are all first hand. Most of our fellows are shirt-sleeve workers who have personally solved the problems.

Get ready for a real sales campaign. Lay your plans now for active sales promotion. Let us be of help to you.

H. Mueller
PRESIDENT

MUELLER-MILWAUKEE

GAS MAIN DUST

Characteristics, Effect on Gas Measurement, Methods of Control

By T. G. WALLACE

Research Laboratory, Los Angeles Gas and Electric Corporation*

THE problem of dust in gas, and its elimination, is one that has been brought to the attention of the gas industry rather forcibly in the past few years, both from a transmission and distribution angle. Dust in transmission lines manifests itself in a large number of operating difficulties including those of accurate orifice measurement. In distribution systems the necessity for dust-free gas is even more urgent. Not only are measurement problems involved, but with the increasing use of new and modern appliances with more complex control mechanism dependent on continuous functioning of pilot lights, dust in the gas is a source of serious trouble to the service man and a costly factor to the company from a customer service standpoint.

T. G. WALLACE

Origin of Gas Main Dust

This dust may be traced to one or all of the following sources:

A. Well Sand. This condition, though not generally reported in California, is an aggravating problem in the Texas and Gulf Coast fields, because most of these wells produce from a loose, fine sand at very high rock pressures and large open flows. This condition is serious if not corrected, but is comparatively easy to control with a bank of efficient gas scrubbers at the field.

B. Construction Dirt. On long transmission lines where the construction is over rough and mountainous country and the sections of pipe are exposed to the elements for any great length of time, a hard scale is formed on the inside wall of the pipe which even careful swabbing will not remove, but the velocity of the gas along with some vibration of the line will loosen this scale and transport it at periods of high velocity. This fast moving dust in turn breaks more scale loose, gradually eroding bends and valves. Care should be taken in construction to keep out foreign matter. One pipe line company reported finding in the line a shovel, several blue prints, a number of small boulders, and a length of chain. Most of this debris will be removed by blowing, especially if the line is blown both ways. It might be remembered that although increasing pressure within the line to a high point, and then suddenly releasing it at one end, gives the impression of tremendous force, the velocity of the gas is at a maximum at the point of discharge, and diminishes to normal line velocity at the point of supply. As the ability of the gas to blow out this foreign matter is in direct proportion to the square of the velocity, the effect of blowing does not reach back many miles from the outlet, and therefore a great deal of heavy and compact debris will remain in the line where the velocity approaches normal.

C. Internal Corrosion. The causes of internal corrosion seem to be as varied as the harmful effects. We are primarily interested in the condition present in the line to cause this corrosion. It is a well established fact that natural gas itself has no corrosive action, but certain impurities, or a combination of constituents contained in this gas, will cause corrosion. The electro-chemical theory requires that liquid water be present on the surface of the metal and that oxygen be present in the gas before serious corrosion can occur. Corrosion of iron by hydrogen sulphide, in the absence of liquid water and at normal temperatures, is not appreciable. However, hydrogen sulphide, although a very weak acid, in the presence of liquid water and free oxygen will readily react with iron or oxides of iron. Fig. 1 shows the effects of hydrogen sulphide on an orifice disc. This disc was in service only two weeks. In this short time pits were etched in this steel plate over an eighth of an inch deep. Carbonic acid is another extremely weak acid found as an impurity in natural gas and while not as virulent as hydrogen sulphide it should be given some thought.

Table No. 1 shows actual chemical analyses of dust found in different parts of the system. It will be noted that these dusts consist predominately of iron oxide Fe_2O_3, and Fe_3O_4, with only a small concentration of the corroding agent present.

Table No. 2 is a physical or sieve analysis of this dust. Close examination will reveal particles ranging from 0.5, inches in diameter down to microscopic proportions.

The resulting effects of internal corrosion are of a varied nature. If the corrosion causes pitting of the pipe walls, leaks will develop, if the internal periphery of the pipe

*Presented before the Southern California Meter Association, May 28, 1936.

FIG. 1. Orifice disc showing hydrogen sulphide corrosion.

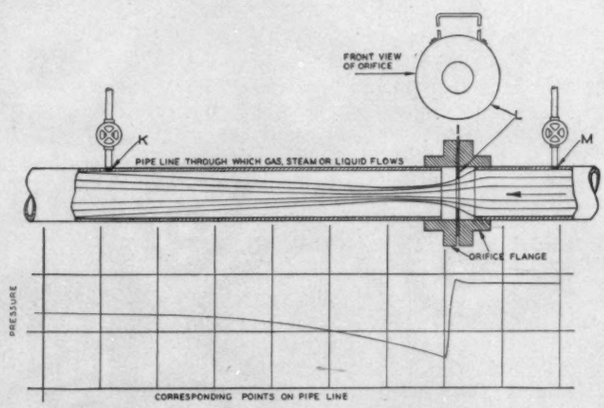


FIG. 2. Theoretical flow of gas through an orifice meter.

TABLE NO. 1. CHEMICAL ANALYSES OF TYPICAL DUST SAMPLES

Location No.	Per Cent of Constituents (by Weight)									
	1	2	3	4	5	6	7	8	9	10
Moisture and Light Oils at 103° C.	1.8	9.2	4.7	9.9	5.1	3.3	2.8	6.9	6.3	8.6
Heavy Oils and Solid Combustible Matter	22.2	29.0	20.4	19.0	14.3	8.4	13.1	13.8	9.8	4.5
Silica and Alumina (Sand and clay)	1.8	3.7	2.4	0.0	1.0	21.9	8.9	12.3	21.4	20.4
Iron Oxide as $Fe_2 0_3$ (ferric)	70.2	*59.1	*72.6	65.0	32.0	66.0	33.8	16.1	30.2	6.3
Iron Oxide as $Fe_3 0_4$ (magnetic)	5.5	†	†	0.7	48.0	0.7	41.4	50.8	30.2	56.6
Total Sulphur	4.0	†	†	6.5	0.1	1.1	Trace	1.2	5.4	9.4

*All iron calculated to ferric oxide ($Fe_2 0_3$)
†Not tested for.
Location No. 1. Distribution gas main.
2. Average of several house regulators.
3. Average of filters in 30 governor vaults.
4. Regulator in distribution system.
Location No. 5. Transmission line.
6. Transmission line.
7. Transmission line.
8. Transmission line orifice meter plate.
9. Transmission line compressor cylinder.
10. Transmission line compressor station inlet.

is roughened by corrosion, the capacity of the line will be reduced, and as the resultant products of corrosion occupy more volume than the metal itself, the effective cross-sectional area is reduced, also reducing the capacity. Corrosion products or pipe line dust cut out compressor valves, rings and liners, regulator valves, discs on orifice meters, and cause trouble right up to the consumer's appliances.

Dust may result from oil lines which have been converted to handle natural gas; also, from manufactured gas lines converted into natural gas lines. In both cases the natural gas dries up the tar, oily dirt, corrosion and gum deposits, forming a fine flocculent dust, much worse to combat than dry iron oxide.

Dust Control and Mitigation

The elimination of dust presents an individual problem in each part of a system and will be an entirely separate problem with each company.

Transmission Problems. It is sometimes necessary to install a gas cleaner ahead of compressor plants, gasoline plants, city gates, and in some cases ahead of orifice meters where residue gas is taken into the system.

We have found that the most efficient type of gas cleaner, if 100 per cent dust-free gas is to be approached, is the oil contact type. There are several good ones on the market. These scrubbers are in most cases designed to use oil as a scrubbing medium but have been successfully operated with water. While water will work fairly efficiently, oil in most cases is better, due to its greater affinity for the dust. The oil loss of a scrubber is based upon the efficiency of the liquid separator, the type of oil used, its vapor pressure and the temperature and pressure of the gas being scrubbed. This loss will be from ½ gallon per MM c.f. to 5 or 6 gallons per MM c.f. In some cases, where the oil picks up gasoline, or the scrubber removes entrained water, there will be an overflow. In these cases a constant level dumping trap will have to be installed. The placing of these scrubbers will of course be different for each system, but as the cost per unit capacity is less when the gas is handled at the highest pressures it is advisable to clean the gas at as high a pressure as possible. It is more desirable to use several small or medium sized cleaners in multiple, rather than one large unit, in case it should become necessary to relocate the cleaners at some future date or to add to or cut down the size of any installation. Many transmission companies have found that by dehydrating their gas they could reduce their water content to a minimum, thereby reducing the corrosion in their lines. There are several different methods of dehydration and as there have been one or two recent papers on this subject it will not be covered again here.

Distribution Problems. Our investigations to date indicate that the difficulties encountered are largely due to the dust originating within our system as a result of internal corrosion and deposition during manufactured gas distribution. There seems to be no explanation other than high velocities or reverse flow, for dust appearance at any point within the system, and it is impossible to determine in advance where the next dust trouble will be encountered. When it does show up in a section, it is then too late to install a scrubber to remove it, as the whole system of mains and services in that territory is usually coated and sometimes partially filled with dust. The only solution seems to be either the installation of filters on all the services and in some cases on the appliances, or oil fogging. We have found oil fogging an effective remedy in one section of our system where dust has been prevalent for a number of years. The oil fog prevents the fine dust from being blown along by wetting the side walls of the mains and wetting the dust along the bottom of the mains, cementing it to the pipe. We have been fogging this district for six months and to date have had no complaints caused by the oil fog, and our dust complaints have been reduced to a minimum. We are fogging with a light oil of 28.7 gravity, with a distillation range of 440° F. to 720° F. One to 2 gallons of oil per MM c.f. is ample to saturate the gas in the 24-inch low pressure line feeding this district. The fog was found, by use of a red dye, to travel to the end of this line, about 2½ miles, and to the remote end of this district, which was a distance of over 3 miles from the fogger.

TABLE NO. 2. SIEVE ANALYSES OF TYPICAL DUST SAMPLES

Location No.	Per Cent of Particle Size Ranges (by Weight)			
	1	2	3	4
On 10 Mesh	13.4	3.8	3.1	1.6
Through 10 Mesh	16.6	7.1	1.5	3.0
Through 20 Mesh	13.7	7.3	1.9	5.9
Through 30 Mesh	11.1	9.9	3.2	8.0
Through 40 Mesh	8.9	10.3	6.8	10.8
Through 50 Mesh	8.2	2.4	7.2	8.8
Through 60 Mesh	3.3	6.5	4.6	10.3
Through 70 Mesh	1.1	6.8	3.0	1.6
Through 80 Mesh	1.5	5.7	4.3	4.1
Through 90 Mesh	1.8	2.8	4.7	4.2
Through 100 Mesh	2.3	1.4	5.6	4.7
Through 120 Mesh	2.6	10.7	12.0	7.9
Through 150 Mesh	7.2	13.4	28.3	23.7
Through 200 Mesh	8.3	11.9	13.8	5.4

Location No. 1. Distribution main.
2. Distribution main.
3. Governor vault dust filter.
4. Transmission line.

Effect of Dust on Gas Measurement

Orifice Measurement. Correct measurement by a sharp-edged orifice is largely dependent on the condition of the upstream edge. Anything affecting the sharpness of this edge will throw off accurate measurement in a surprising manner. Plates should be carefully cleaned before being placed in the flange; if still greasy, they should be thoroughly washed with gasoline or a suitable solvent to remove all substances to which dust and impurities may cling.

A fluid, in passing through a square sharp-edged orifice, attains an inward component which reduces the area of the stream to a cross section somewhat less than that of the aperture through which it passes. The effect increases to a point of maximum contraction at the *vena contracta,* some distance downstream from the plane of the orifice, and from this point the fluid gradually resumes the normal flow condition, bounded by the walls of the pipe (See Fig. 2). The fluid flow from the upstream plane of the orifice is therefore convergent, and the jet is more or less independent of the bounding walls of the aperture, except at the upstream face. The results obtained with an orifice are, therefore, extremely dependent on the condition of this upstream edge, whereas the downstream edge is relatively unimportant. Example A, Fig. 3, illustrates the effect which a rounded or dull upstream edge has upon the ratio of the jet to orifice cross section. The result is that the discharge coefficient approaches 1.0. The round edge, due to the greater cross section of the jet, permits a greater flow of gas at the same differential pressure. In short, the result will be a slow meter. The same effect will result from dirt collecting on the upstream side of the orifice plate as shown in example D, Fig. 3. The per cent of inaccuracy will, of course, depend on the amount

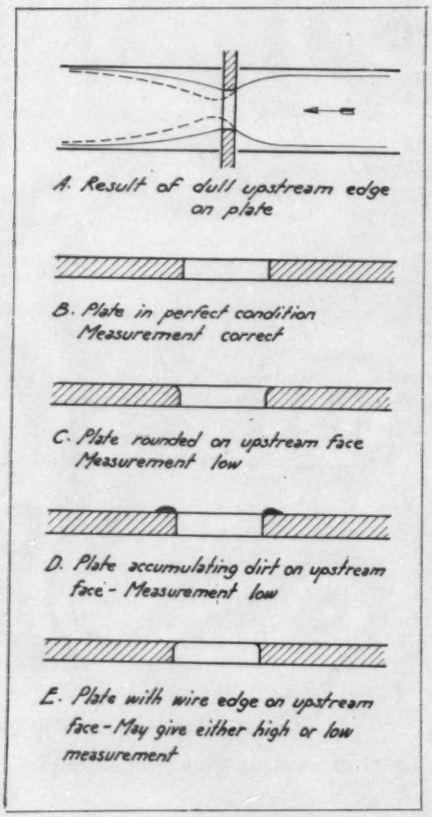

A. Result of dull upstream edge on plate
B. Plate in perfect condition Measurement correct
C. Plate rounded on upstream face Measurement low
D. Plate accumulating dirt on upstream face - Measurement low
E. Plate with wire edge on upstream face - May give either high or low measurement

FIG. 3.

and exact location of the dirt present on the plate. A 9 per cent error has been known to result from a deposit of ⅛-inch of dirt on the upstream face of a disc. An out-of-roundness of the pipe will also cause considerable error; a change of 0.5 per cent of the diameter of the pipe will bring the error beyond the allowable tolerance for flanged taps, and the same error for pipe taps would be one half of this amount; therefore, a small deposit of dirt along the bottom of a pipe on the upstream side of the orifice can be considered a serious handicap to correct measurement. A coating of dirt all around the upstream side of the pipe will change the ratio of the orifice to the pipe diameter. It has been found that a small coating will give a comparatively large error. If the dirt be oily or moist, making an irregularity in the pipe, it will create eddies and complex turbulent flows, still further interfering with correct measurements. Sometimes during slow flows, oily dust will gradually build up and pack on the periphery of the orifice, tending to change the whole method of measurement. A nicked orifice plate will give serious errors and it seems to make no particular difference whether the nicks are on the upstream or downstream side of the plate. With flanged connections errors of 2.82 per cent have been recorded; with open flow a 2.17 per cent error was found. The reasons for these errors are that burrs, dents, scratches, and a wire edge such as shown in example E, Fig. 3, (a result usually of poor grinding), and scratches upon the sharp edges of the plate, change the smooth straight line flow to irregular eddy currents to such an extent that true conditions are not met.

It can easily be realized that particles of sand, corrosion products and other impurities can, in a very short time, create havoc with proper orifice measurement. In the past we have been unable to tell to what extent accumulations of dirt and sandblasted orifice discs affected measurement, but with the new A. G. A. specifications we can readily determine this error and correct for it. To stress the importance of clean and properly finished discs, the new A. G. A. specifications are quoted: "The upstream edge of an orifice shall be square and sharp so that it will not appreciably reflect a beam of light when viewed without magnification. It shall be maintained in this condition at all times. Moreover, the plate is to be kept clean at all times and free from accumulations of dirt, ice, and other extraneous material."

Domestic and Commercial Meters. Fine dry dust seems to have no particular effect on the accuracy of a properly calibrated domestic meter, although it is known to have an abrasive action on all movable parts and a tendency to dry out the oiled diaphragms. In some cases it has been known to lodge in the bottom of the bellows and in time rot out the bottom of the leather diaphragms, making an inoperative meter. In large domestic and small commercial meters enough dust has been caught in the meter to completely choke it, resulting in a "no gas" complaint. If the meter valve is oily or the dust damp or flocculent it is certain to cause some trouble, usually a gummy valve which would materially slow down the meter.

In large commercial installations where instantaneous demands are high we get high velocities in the service leading from the main to the meter and any loose dust or foreign matter in the main is almost certain to be swept up into the meter. As meters, especially oil sealed ones, are notoriously efficient dust traps, service calls usually result after one of these high demands. It is advisable to place some type of gas filter or scrubber before large commercial meter installations, if only to keep the larger particles out of the working parts.

The following tabulations are the results of a two months' examination of 7,266 incoming domestic meters to determine the effect of internal conditions of meters on meter proof.

IRON METERS
(First Month)

Accuracy*	Number Tested	Clean	Dust Present	Gummy Valves
Fast	721	72%	20%	8%
O.K.	1600	67%	19%	14%
Slow	313	40%	20%	20%
	(Second Month)			
Fast	919	67%	11%	22%
O.K.	2026	57%	11%	32%
Slow	399	36%	12%	52%

TIN METERS
(First Month)

Fast	161	71%	6%	23%
O.K.	541	74%	8%	18%
Slow	51	72%	10%	18%
	(Second Month)			
Fast	125	88%	6%	6%
O.K.	376	87%	5%	8%
Slow	34	80%	12%	8%

No D.R. or stuck meters included in these figures.
*Plus or minus 2% from O.K.

It is evident that dust, as such, has had no effect on the accuracy of these meters.

Twelfth Gas Measurement Short Course

THE twelfth Southwestern Gas Measurement Short Course was held at the University of Oklahoma, Norman, Okla., on April 21, 22 and 23. Representatives from 23 states and three foreign countries made an attendance of 506.

A report of interest was made by Ray Roundtree of the United Gas Public Service Co., Houston, Texas, on the work covered during the past year by the Committee for the Study of Practical Methods. Max Watson, chairman of the Publication Committee, has announced that the proceedings of this year's short course will be published in bulletin form.

Prizes are again being offered in a "What I Learned at the 1936 Meter School" contest. There are seven prizes for the best reports: The first prize is $15; second, $10; and five $5 prizes.

E. E. Stovall, Lone Star Gas Co., Dallas, Texas, chairman of the program committee for this year's course was elected general chairman for 1937. W. H. Carson, director of the School of Natural Gas Engineering, University of Oklahoma, was re-elected secretary and treasurer.

■ ■

Gas Main Dust Discussed at S. C. M. A. Meeting

THE regular monthly dinner meeting of the Southern California Meter Association was held on the evening of May 28 in the banquet room of the Cole Cafeteria in Huntington Park. President F. E. Bradley introduced T. G. Wallace, of the research laboratory of the Los Angeles Gas and Electric Corp., who presented the paper on "Gas Main Dust," published in this issue.

President Bradley then introduced D. M. Hill, of the Foxboro Co., program chairman, who in turn introduced G. L. Strehlke, of United Air Lines. Mr. Strehlke took the audience behind the scenes of the air transportation business in an interesting talk which was followed by a motion picture entitled "Across America in 16 Hours."

The next industrial inspection trip of the S.C.M.A. will be on June 18 to the Southern California Telephone Co.'s Los Angeles main plant building.

■ ■

DeBurn Joins Associated Piping & Engineering

Arlan E. DeBurn, connected with oil and gas industry equipment sales work in Southern California for the past 10 years, joined the Associated Piping & Engineering Co., Ltd., Los Angeles, last month in the capacity of sales engineer. Mr. DeBurn for several years was in charge of engineering sales for the Pacific Pipe & Supply Co., and more recently has been engaged in liquefied petroleum gas activities.

■ ■

J. H. White Passes Away

J. H. White, president of the Southern Natural Gas Co., since its inception in 1929, passed away recently in Birmingham, Ala. Prior to his connection with Southern Natural Mr. White was vice-president and general manager of the Semet-Solvay Co.

Peoples Gas Light Refunding Program Approved

AT a special meeting on May 20 of the stockholders of the Peoples Gas Light and Coke Co. in Chicago, final approval was given the company's refunding program which calls for the issuance of $22,000,000 of new bonds. Proceeds of the new issue plus additional bank borrowings will be used to retire $18,659,000 outstanding 6 per cent bonds and $9,809,000 outstanding 5 per cent bonds. The new bonds are expected to carry a 4 per cent coupon.

The refunding will reduce the company's funded debt by approximately $5,000,000, lessening annual interest requirements by $750,000.

To reduce the appraised value of the company's assets by approximately $14,500,000 and to eliminate certain "intangible" assets which have been carried on the books for many years, the directors of the Peoples Gas Light and Coke Co. on May 7 approved changes in the company's financial set-up, listing its property at $153,690,000 instead of $168,230,000 as shown in the annual report of 1935.

■ ■

Calif. Gas Appliance Society's "Sticker Plan" Hits New High

THE Gas Appliance Society of California employed its effective "sticker plan," first used in 1932, to raise funds for conducting its "A Corsage for Your Kitchen" gas range campaign which ran from April 25 to May 2. Indicating the success of the campaign, more stickers were sold in April than in any month since the inauguration of this sticker plan.

The method consists of having the distributors buy stickers for their stock merchandise. The stickers are priced to scale for different appliances, ranging to as high as 50c for the stickers on ranges. The distributor bills the retailer for half the cost of the sticker on each appliance. In this way the cost of the stickers is equally distributed. For every $2 raised jointly in this manner, the Pacific Gas and Electric Co. pays $1 into the fund.

A questionnaire is now going to all manufacturers, and dealers who participated in the "sticker plan," as well as to P. G. and E. dealer representatives, from which results of the recent gas range drive will be compiled. *GAS* will report these figures in the next issue.

■ ■

American Radiator Publishes Cellar Rehabilitation Booklet

American Radiator & Standard Sanitary Corp., New York, has published a comprehensive booklet on the rehabilitation of cellars into livable rooms that is made possible with the installation of modern conditioning equipment. The booklet is entitled "The Cellar Reborn" and in addition to text contains 36 pages of illustrations of remodeled cellars with the floor plan of each and an itemized estimated cost list of materials necessary to effect the conversion.

Each of the rooms illustrated was designed for the cellar of an existing home, and the illustrations are photographs of scale models of these rooms that were shown recently at the company's exhibit in Rockefeller Center, New York, and that are now on tour. With the photograph of the model and the floor plan for conversion, is a photograph of the existing condition in the respective cellar.

■ ■

Utility Taxes and T. V. A.

That privately owned utility companies in TVA area paid taxes last year 270 times as great as those paid by the TVA project was revealed recently in a newspaper advertisement of the Alabama Power Co. During 1935 the TVA controlled 250 million dollars worth of property in Tennessee and Alabama, and according to its annual report, paid only $16,900 in taxes on this property. Alabama Power and its associate, the Tennessee Electric Power Co., owning approximately the same amount of property, paid 4½ million dollars in taxes.

■ ■

Struth Appointed Statistician

H. J. Struth has been appointed statistician for the Mid-Continent Oil & Gas Association of Texas, headquartering in Dallas. Mr. Struth is a consulting petroleum economist and the publisher of "Petroleum Economic Service." Having served as special technical adviser to the Petroleum Administrative Board, Washington, D. C. and as secretary and district allocator for the Gulf Coast District appointed by the Planning and Coordination Committee for the Petroleum Industry, Mr. Struth is well equipped for his new duties.

1876 — CONNELLY — 1936

Back Pressure Valves

Choose the CONNELLY Valve to prevent reverse flow in your gas lines. The CONNELLY insures safety on industrial burners using boosted air pressure. The check disc is light weight to provide low differential. Special discs are used in heavy duty. Easily accessible for inspection. Available in all standard pipe sizes.

U-GAUGES

Universal U-Gauges using glass substitute tubing threaded into metal fittings—Normally "unbreakable". Graduated scale is etched on metal.

CONNELLY PRODUCTS

Caloroptic BTU Indicator; Governors; Valves; Regulators; Gas Purifying Materials.

Connelly Iron Sponge & Governor Company
Chicago, Illinois: 3154 South California Avenue
Elizabeth, New Jersey: 200 South Second Street
N. E. Agent—T. H. Piser, Waban, Massachusetts

A FULTON *is at Home*

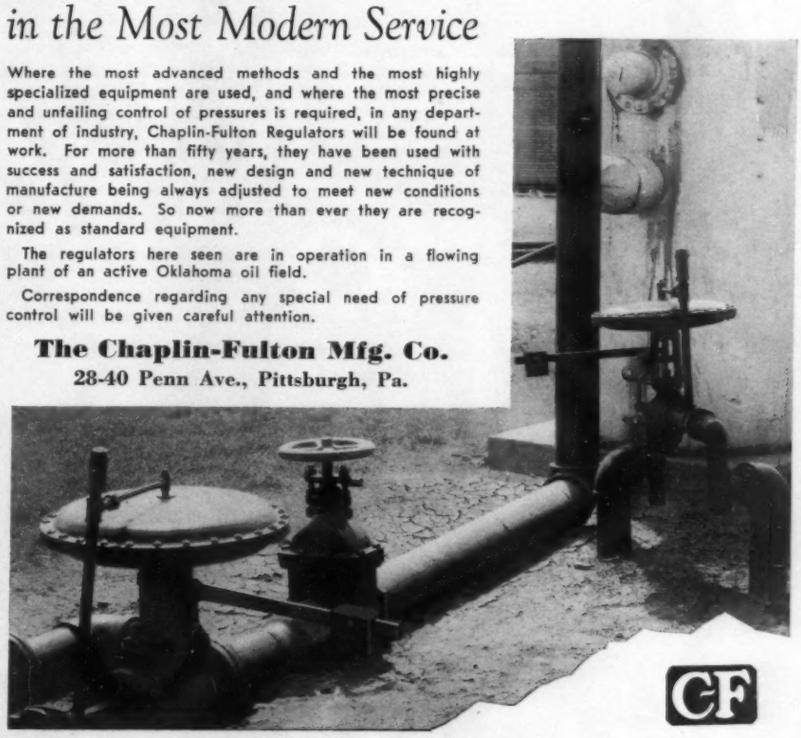
in the Most Modern Service

Where the most advanced methods and the most highly specialized equipment are used, and where the most precise and unfailing control of pressures is required, in any department of industry, Chaplin-Fulton Regulators will be found at work. For more than fifty years, they have been used with success and satisfaction, new design and new technique of manufacture being always adjusted to meet new conditions or new demands. So now more than ever they are recognized as standard equipment.

The regulators here seen are in operation in a flowing plant of an active Oklahoma oil field.

Correspondence regarding any special need of pressure control will be given careful attention.

The Chaplin-Fulton Mfg. Co.
28-40 Penn Ave., Pittsburgh, Pa.



CF

Perfect Control of Bottled Gases

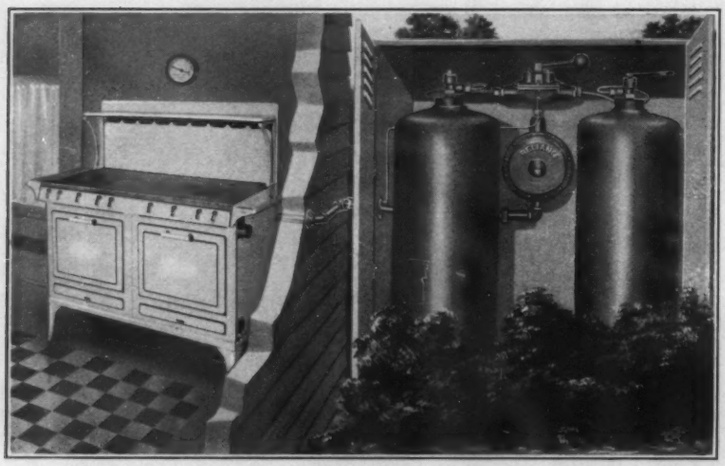
Variable cylinder pressures are reduced to uniform outlet pressures of from 3 to 10 pounds by Reliance Type MR Primary Regulators. Installed with Reliance Type B or BK Secondary Regulators, pressures are further reduced to any desired inches of water for proper use of the gas.

When employed with two cylinders, Type MR Regulators automatically draw on one or both depending on the load and generating capacity of the cylinders. An indicator, placed at any convenient point, shows the condition of the supply at all times and warns the user when the reserve cylinder comes into service. For larger than ordinary capacities, Reliance Type MC Primary Regulators are recommended. This equipment is controlled exclusively by Reliance under Patent No. 1,960,466.

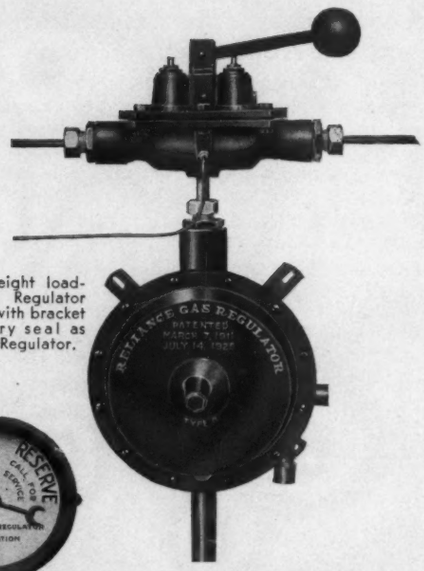
Reliance Regulators are available in a complete line for the perfect control of butane, propane, manufactured, natural and mixed gases. Various types for liquid petroleum gas service have been thoroughly tested and approved by the National Board of Fire Underwriters.

Send for complete Bulletins.

RELIANCE REGULATOR CORPORATION
1000 Meridian Avenue, Alhambra, California

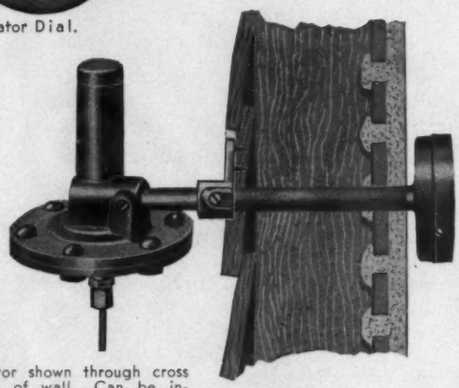


Typical domestic installation of Type MR Regulator and indicating dial for automatic control of bottled gas fuels.

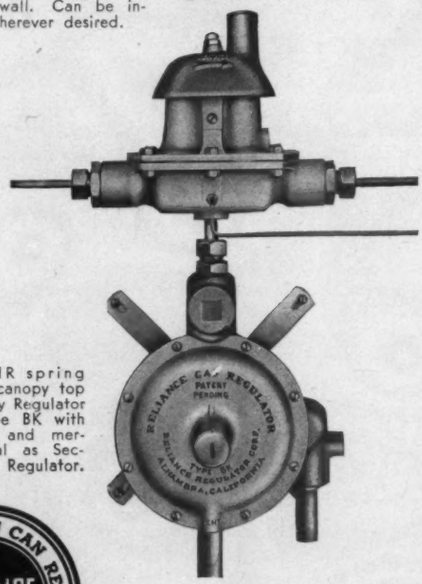


Type MR weight loaded Primary Regulator and Type B with bracket and mercury seal as Secondary Regulator.

Indicator Dial.



Indicator shown through cross section of wall. Can be installed wherever desired.



Type MR spring loaded canopy top Primary Regulator and Type BK with bracket and mercury seal as Secondary Regulator.

REGULATORS YOU CAN RELY ON
RELIANCE
SINCE 1910
TRADE MARK

RELIANCE REGULATORS

BUTANE-PROPANE NEWS

Experiment with Fusion-Welded Tank Cars

Several petitions for the use of fusion-welded tank cars were recently approved by the Interstate Commerce Commission. By the terms of this decision Union Tank Car Co. is authorized to construct 25 such cars, E. I. duPont de Nemours & Co., one car, and Phillips Petroleum Co., not to exceed 25.

This is a radical exception from the Commission's policy of making forge-welded construction for tank cars mandatory. If the fusion-welded cars prove satisfactory in service, it is possible that the Commission will make this type of construction generally permissable, in which case great savings can be made in cost of fabrication.

However, as pointed out by W. E. Cooper, of the Bureau of Explosives, the fusion-welded tank cars thus far authorized are on a definitely experimental basis.

■ ■

"Modern Gas Ranges and Your Motor Car"

Through arrangements made by the National Bottled Gas Association, a booklet entitled "Modern Gas Ranges and Your Motor Car" has been made available to the bottled gas industry. This booklet, designed to combat electric range competition, draws a parallel between the modern automobile and the modern gas range, stressing their common qualities such as flexibility of control, freedom from parts replacement, etc.

Bottled gas operators desiring further information may communicate with the publishers, Evans-Winter-Herb, Detroit, Mich. The booklets are obtainable in quantity on a sliding-scale price basis, which begins with a figure of $11 for 1,000 copies.

■ ■

Col. Dunn Passes Away

Colonel B. W. Dunn, chief inspector of the Bureau of explosives until recent illness forced his retirement, died on May 10. Colonel Dunn was selected to organize the Bureau and upon his retirement from the Army in 1911 after 30 years of service, was appointed its chief inspector. He was well known to members of the bottled gas industry and esteemed as a counsellor.

■ ■

Bulk Station Completed

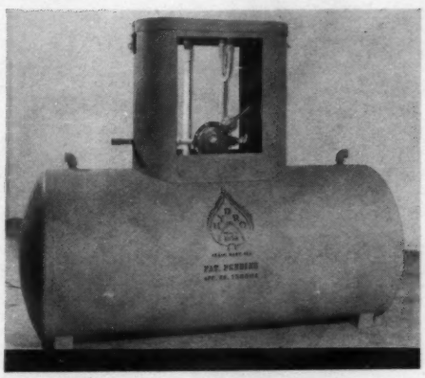
Utilities Distributors, Inc., suppliers of bottled gas in northeastern United States, put its new, 15,000-gallon bulk station into operation on May 8. Headquarters of the organization have been moved from Bangor, Me., to Portland, Me., site of the new station.

■ ■

C. G. M. A. Board Meeting

The executive board of the Compressed Gas Manufacturers Association will hold its summer meeting June 18 to 20, at the Seaview Golf Club, Absecon, N. J.

Hydro-Gas Individual Butane Service



Hydro-Gas storage tank showing "stand pipe" housing a regulator, relief valve and filling line.

A NOVEL method for the distribution of low boiling point liquid gas, is used by the Hydro-Gas Co. of San Antonio, Texas. A gas of approximately 3200 B.t.u. value consisting principally of normal butane is distributed under this system to individual farm and suburban residents as well as to commercial customers, off the gas line.

The plant merely consists of a welded storage tank buried on the customer's premises, vaporizer and revaporizer unit and household type regulator set to deliver gas at 10 inches water column.

Storage tanks are furnished in five sizes, ranging from 85 gallons to 1,000 gallons capacity. These tanks are normally buried approximately 2 feet deep, or below frost line. Attached to the tank is a metal "stand-pipe" with hinged cover which extends to the ground level. In this "stand pipe" is installed the household type gas regulator, pressure relief valve and filling line. All tanks are of welded construction, built for a working pressure of 90 pounds, according to A.P.I.-A.S.M.E. specifications for unfired pressure vessels.

Vaporization of the N-butane is accomplished by connecting the household water supply line to a small tank called the primary vaporizer, incorporated in the larger liquid gas storage tank. In this manner any water used on the consumer's premises must flow through the liquid butane. It is stated that in actual operation, sufficient heat is transferred to the butane by this method to insure adequate supply of vaporized gas at all times. By the installation of the storage tanks below frost line, an additional heat supply for vaporization is present in the natural ground temperatures.

As condensation of the vaporized gas may occur in the gas supply lines leading to the customer's houseline or appliances, to overcome this feature the supply lines are carefully graded and provided with a method for returning this condensate to a chamber incorporated in the primary vaporizing chamber. Here the condensate is re-gasified and returned to the household supply line. It is stated by the distributors that this provision prevents any gas in liquid form entering the customer's house and insures delivery of a "dry" gas at all times.

Hydro-gas is sold principally in Oklahoma and Texas through distributors who buy their liquid gas locally according to specifications. Delivery to the customers' premises is accomplished by tank truck.

■ ■

Illinois Bottled Gas Co. Sales Convention

Illinois Bottled Gas Co., Chicago, held its annual sales convention recently in Rockford with some 100 dealers attending. B. D. Geroy, sales manager of the company, presented the sales promotion program for the year, then introduced J. D. Adams, assistant sales manager, who gave a talk on "How to Present Bottled Gas to Prospects."

E. C. Sorby, sales promotion manager of the Geo. D. Roper Corp., demonstrated the new line of Roper ranges and discussed sales promotion problems. Prior to the meeting the group made an inspection tour of the Roper plant, according to the "Roper Ranger", company house organ.

■ ■

Bottled Gas Comes to Rescue in Flood Area

Bottled gas came to the rescue of many institutions that were left without service by recent floods. Among notable instances in which bottled gas made it possible to carry on were the Manchester Memorial Hospital and the Manchester Evening Herald in Manchester, Conn. When the gas supplies of these institutions were interrupted by the rising of the Connecticut River, the Philgas Department of the Phillips Petroleum Co. made temporary installations at both these places that were used until the regular gas supply was restored. The Manchester Evening Herald was able to continue publishing without missing an issue during the flood period.

■ ■

San Joaquin Campaign

San Joaquin Light and Power Corp., Fresno, Calif., opened an automatic gas water heater campaign on April 1 that will run until June 1. According to Monty C. Pfyl of the sales department, as of May 14, 310 heaters had been connected which is 96 per cent of quota for the entire drive.

In the July issue of *GAS* the campaign will be described in detail together with final results.

KEROTESTS

the ideal valves for modern propane gas service

Incorporating the famous Kerotest Diaphragm Packless design, these strong, pressure-tested valves can be inspected or repaired while under full pressure without interrupting service from the line—thus extending their service indefinitely They are listed as standard by the Underwriter's Laboratories and are available with or without handwheels. Try them on your next job.

KEROTEST MANUFACTURING CO.
PITTSBURGH, PA.

Marfa, Texas, to Have Butane-Air Plant

Contract has been let for the construction of a municipal butane-air gas plant for Marfa, Texas, according to A. V. Brenner, consulting engineer for the project. The undertaking is being financed by a $72,500 P.W.A. loan and grant.

Issuance of the work order is expected momentarily, and as soon as it is received work will be commenced on the plant and distribution system which will require about three months to complete.

The project is based on serving 400 domestic consumers and will be capable of handling 600. Commercial butane will be supplied in tank car lots to the central mixing plant.

■ ■

Mt. Vernon Butane Plant

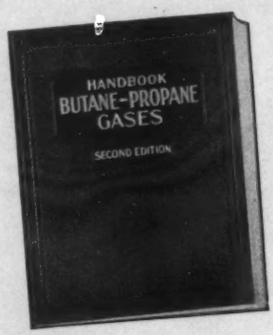
Construction is now under way on the butane-air gas plant in the city of Mt. Vernon, Ind., according to D. T. Blakey, consulting engineer in charge of the municipal project. Approximately three months will be required to complete the plant. It is being constructed at a cost of $45,000 and has been designed to serve 300 meters.

■ ■

Bulk Station at Hammonton

Natural Gas Co. of New Jersey, Hammonton, N. J., is installing a 15,000-gallon bulk station that is now nearing completion. This firm supplies bottled gas in the southern portion of New Jersey.

THE ONLY HANDBOOK OF **BUTANE-PROPANE GASES**

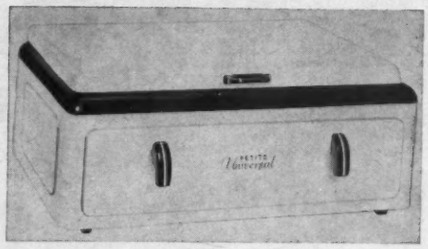


Big Second Edition Now Available

CONTENTS: Summary of Two Years' Developments: Use in Internal Combustion Engines: Design and Installation of Storage: Supply from Petroleum Refineries: Engineering Data on the Lower Olefins: Domestic Appliance Testing and Utilization: Economic Comparisons with Coal, Oil, Electricity, Producer Gas, Manufactured Gas: Town Plants: Manufacture from Natural Gas: Special Uses: Volume Correction Factors: Supplements and Revisions: Transportation: Use with Other Gases: Analysis and Testing: Properties of Mixtures: Bottled Gas Distribution: Bibliography: Central Plant Directory: Catalogue Section:

$5.00—Send Check or Money Order To

GAS, *Publishers*
809 So. Main St.
Los Angeles, California
Write for circular describing contents in detail.



Cribben and Sexton New "Petite Universal"

CRIBBEN & SEXTON CO., Chicago, manufacturer of Universal gas ranges, announces a new two-burner table stove, the "Petite Universal." This unit is designed to meet electric hot plate competition in one-room apartments, domestic science classes, lunch rooms, drug store fountains and in small restaurants by giving modern top burner cooking performance. It is suggested that this model might be used as a demonstrator of gas cooking by salesmen or for trial installations.

The Petite Universal is finished in full porcelain enamel throughout and its gas valves are made of Bakelite with a center strip of chromium. The unit measures 7¼ inches high, 19⅞ inches wide and 14¼ inches deep. It is equipped with two Simmer-Save, self-lighting burners made of round, polished, die-cast aluminum; porcelain Thriftop cooking top with formed-in burner bowls; and round, removable porcelain cast grates. The lift-up cover top is porcelain-lined.

■ ■

Cook Book Premium

To prospects that arrange to install Philgas equipment prior to June 15, the Philgas Department of Phillips Petroleum Co. is giving free a copy of "The Mystery Chef's Own Cook Book," the cook book sponsored in the "Mystery Chef" broadcasts of the Regional Advertisers, Inc. This premium carries a book plate inscribed with the prospect's name and bears the autograph of the "Mystery Chef." It is the complete unabridged book containing 366 pages.

■ ■

Non-I.C.C. Containers

At the convention of the National Fire Protection Association, held at Atlantic City, N. J., May 11 to 14, tentative approval was given to non-I.C.C. containers for domestic, underground bottled gas installations.

Before this type of container is presented to the Association for final adoption, the Committee on Gases, in conjunction with members of the Compressed Gas Manufacturers' Association, will do further work on specifications and regulatory details.

■ ■

Taft and Vaughan Promoted

S. W. Taft and A. L. Vaughan, both formerly in the compressor department of Lone Star Gas Co., have been appointed superintendent of compressor stations and foreman of compressor station construction, respectively, for Northern Natural Gas Co. Mr. Taft has been in charge of construction of a number of compressor stations for Lone Star and Northern Natural.

Marbles to Plate Glass

(Continued from Page 19)

ing a typical conversion tank to natural gas gives an idea of the various problems encountered.

This tank was rectangular in shape, having a melting area of approximately 800 square feet. A normal day's pull was from 65 to 80 tons, which is a relatively low rating. Firing was from five producer gas ports on each side with typical regeneration of air and producer gas.

Because of the high crown, considerable concern was expressed regarding efficiency of firing with a concentrated fuel, such as natural gas, there being some doubt as to whether a blanket of flame could be held on the surface of the glass. Since the cost of lowering the crown was excessive and would have very probably defeated the acceptance of natural gas, it was decided to make an application with substantially no furnace changes. The principal change was changing the flat port structure to an inclined type which is a common desgin on both producer gas and natural gas firing. It was felt that the port inclination would have a tendency to direct the flow of air and gas to the surface of the glass and prevent its rising into the arch of the crown.

The gas was applied to each port in such a manner as to avoid turbulence and to protect the gas from intimate mixture with the air for sufficient length of time to allow the gas to crack, forming free carbon which produced a heavy luminous flame.

After the tank was started, it was found that the flame action was as had been anticipated. A heavy luminous flame hugging the surface of the glass extended across the tank with its tips in the opposite ports. The fuel consumption per ton ran from 8 to 9 million B.t.u. with glass production of 65 to 80 tons per day. The quality of the glass was very satisfactory.

Furnace Life: The erosion of the flux blocks, or tank blocks, upon which the life of the tank depends, varies almost directly with the amount of glass pulled. Consequently, when a tank is operated at high capacity it must be rebuilt more frequently, but the total cost of glass per ton comes down because the melting efficiency increases. This increase of furnace efficiency results, of course, because the radiation losses from the tank which form a large part of the total heat requirement remain relatively constant whether the tank is being pulled light or heavy.

Glass manufacturers have been reluctant to cut down this radiation loss by insulation because of the high working temperature which would increase refractory erosion. As a matter of ract, the tank blocks are cooled to prolong their life by blowing air over the exterior surface. A common run on a tank is from 12 to 14 months. The bottom lasts at least two fires. The crown lasts several years.

Subsequent Operations: Generally speaking, after the glass has been melted and refined in the furnace and formed by machine or hand operations, it must undergo other heat treatment such as fire polishing, and it must always be annealed in furnaces which are called lehrs. After that, it may be a finished product or may have other heating operations performed, such as decorating, which consists of fusing a low-temperature glass or glaze into the glass surface.

Only some of the high spots in glass manufacture have been mentioned. There are many other phases. Each step offers complications and engineering problems. A glass plant is no place for a complacent man.

■ ■

Cities Service Rate Reduction

New rate reductions were made last month by the Cities Service Co., bringing lower rate schedules in 75 Kansas cities and resulting in an annual saving to customers of $733,583. This announcement came at the recent final settlement of the Cities Service gas rate case, pending for the last five years before the State Public Service Commission. In addition to the rate reductions, the company agreed to pay litigation costs, which amounted to approximately $171,000.

■ ■

"Fall Market Week"

Gas appliances will participate in a radio and appliance show that will be featured in a "Fall Market Week" which has been set for August 3 to 8 in the Furniture Exchange in San Francisco. Both gas and electric appliances will be featured in the displays.

Where Uniform Capacity is Doubly Important

Hackney cylinders for liquefied petroleum gas are unvaryingly, uniformly accurate in capacity. The importance of that factor is plain.

And the fact that Hackney cylinders are uniformly accurate in capacity has an added importance. It is good proof of the skill and care that go into the production of Hackney cylinders.

They are accurate in every detail . . . uniform in high strength and light weight . . . uniform in reliability of operating devices . . . good appearance and strength of welding . . . smoothness of the walls, both interior and exterior.

Through uniformly high quality alone, Hackney cylinders have won tremendous acceptance in this field.

Hackney MILWAUKEE

PRESSED STEEL TANK COMPANY

1185-208 S. La Salle St., Chicago, Ill.: 6633 Greenfield Ave., Milwaukee, Wis. 666 Roosevelt Bldg., Los Angeles; 1363 Vanderbilt Concourse Bldg., New York

Containers for Gases, Liquids and Solids

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Load Building News

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THE MODERN FUEL

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Managing Director
(P. C. G. A.)

VOLUME 8, NO. 6 *Eighth consecutive year of regional cooperative advertising, Pacific Coast Gas Association* JUNE, 1936

THESE PERSUASIVE ADVERTISEMENTS WILL APPEAR IN JUNE MAGAZINES

SUNSET MAGAZINE ← and other domestic media

Listen! Silent as snow,

the GAS refrigerator creates constant cold with never a whisper of gr-r-ind, hum or whir. A tiny gas flame miraculously *freezes with heat.*

It can't make a noise — there are no moving parts. And motionless parts can't wear. That means carefree durability.

Operating cost? Compute it in split pennies! Gas consumption corresponds to that of the *pilot light* on your range or water-heater.

GAS refrigeration is sweeping the country. Sales tell the story. 1934, 57 per cent ahead of 1933 — last year, 56 per cent gain over 1934. And now far on the way to sensational new records.

Shop by ear. Hear refrigerators *in operation* before you buy. Shop by eye too, and the GAS refrigerator will win you with its brilliant, modern design, its host of year-ahead features. Shop by *any* standard and let comparative facts decide. — *Pacific Coast Gas Association, Inc., (a non-profit service organization of which your Gas Company is a member) 447 Sutter Street, San Francisco, California.*

See LOCAL APPLIANCE DEALERS or YOUR GAS COMPANY

Gas THE MODERN FUEL — NEW 1936 Air-Cooled ELECTROLUX THE Gas REFRIGERATOR

APPLIANCE DEALERS' Trade Journals ↓

A Clearing House FOR GAS APPLIANCES

"VERY PROFITABLE" is the way H. A. Storry of Storry & Sons, Berkeley (Calif.) sums up his Gas Appliance business.

During 1935, this long-established plumbing, heating and hardware firm sold 138 gas ranges, approximately 150 water heaters, 100 gas refrigerators and many small heating appliances.

"About one-third of our total hardware and plumbing business consists of gas appliance sales," Mr. Storry says. "And we realize it is a very important factor in view of the Gas Company through advertisement given by the Gas Company through ad, servicing dealer helps and the development of time-financing plans.

With your Gas Company as an active ally, you also can win added success on the economical issue. Victory's onward, in Gas Appliance merchandising — immediate cash profits. Are you getting your due

— *Pacific Coast Gas Association, Inc., (a non-profit service organization of which your Gas Company is a member) 447 Sutter Street, San Francisco.*

YES, a "cleaning house"! For the modern gas appliances so ably displayed by Washington Furniture Co. do not remain upon the floor.

Average sales average more than a day. Gas refrigerators are so popular, they have other types in this merchandising pace heaters swell the total of appliance

distant from the congested district, and conve-

ing to the middle class or medium-price trade, this limitation is far-famed for its sales promotion methods.

Mr. Wood is a pioneer in retail radio advertising. Radio programs (on two stations) and other advertising consistently tie in with Gas Company sales plans.

Washington Furniture Company does no house-to-house selling, but consistently upon bringing prospects into the store. An efficient, well-trained floor staff converts a surprising percentage of visitors into customers. Good service helps to make and keep friends.

IF YOU are not "cashing in" on the ever-increasing demand for modern Gas Appliances you are passing up a real opportunity. *Pacific Coast Gas Association, Inc., (a non-profit service organization of which your Gas Company is a member) 447 Sutter St., San Francisco.*

For Details on Dealer Cooperation
YOUR LOCAL GAS COMPANY

GRAVEN-INGLIS BAKING CO.
STOCKTON, CALIFORNIA
April 15, 1936
Regarding the gas oven installation made some time ago, it has been working very satisfactorily and is quite a saving to us over previous installation of liquid fuel.
We find gas to be much simpler and cleaner to operate and we are very happy to recommend it to any bakery.
Yours truly,
GRAVEN-INGLIS BAKING COMPANY
By

The largest baking concern in Stockton, California is now all-gas equipped. Illustrated is one of the continuous-feed ovens (bottom bread) recently converted to gas.

Another continuous-feed oven for pan and bottom bread was similarly converted. Likewise a 50-H.P. boiler. Now all-gas equipment includes a traveling rotary oven, capacity 1,000 loaves an hour, and a rotary oven for pies and cakes.

If you are using a less modern fuel, compare it with GAS — in speed, cleanliness, dependability, controllability and economy. — *Pacific Coast Gas Association, Inc., (a non-profit service organization of which your Gas Company is a member) 447 Sutter Street San Francisco, California.*

WESTERN BAKER ←

Additional Sales Messages Not Illustrated Here

The June message to Architects, Builders and Home Owners *(California Arts and Architecture; Architect and Engineer)* features a Los Angeles Medical Building, with gas heating and air conditioning. Full page space in *California Homes* is built around an all-gas installation in a new Berkeley home. Hotel and Restaurant publications carry an advertisement on the new Grison's Restaurant, San Francisco, completely gas equipped.

Colorful Convention Is Assured for Canadian and West Coast Groups

A GREAT meeting is shaping up for early July in Vancouver, B. C. The Canadian Gas Association and the Pacific Coast Gas Association are joining hands to produce the program, combining the Canadian group's 29th annual meeting with the P.C.G.A. annual Northwest Conference for the first time.

John Kiellor of B. C. Electric Railway Co. Ltd. is in the role of official host, as president of the Canadian gas men; H. M. Crawford, president of the west coast group, will lead a large delegation of P.C.G.A. members to Vancouver, and will himself contribute to the program.

Hotel reservations are already at a premium, says G. W. Allen, secretary-treasurer of the Canadian Gas Association. They should be made direct with Hotel Vancouver, convention headquarters. The dates are July 8, 9 and 10.

This is Vancouver's golden aniversary, an official Jubilee Year in the city, with a million visitors expected from all quarters of the globe. Jubilee entertainment will add to the city's attraction for gas men, in addition to a full convention entertainment program. Sight-seeing trips, the annual banquet, and some surprise features will fill the social side of the convention.

Business discussions arranged for the meetings cover a varied range, including these feature topics:

"Storage of Natural Gas in the Bow Island Field, Alberta, Canada"—by P. D. Mellon, general superintendent and chief engineer, Canadian Western Natural Gas, Light, Heat & Power Co., Ltd., Calgary, Alta.

"Emergency Inhalator Calls"—Contributed by Montreal Light, Heat & Power Co., Montreal, Que.

"The Modern Fuel Needs Modern Advertising"—by James Lightbody, publicity manager, B. C. Electric Railway Co., Ltd., Vancouver, B. C.

"Notes and Calculations on Ammonia Recovery at a Coking Plant"—by Arthur A. Todd, chemist, Ottawa Gas Co., Ottawa, Ont.

"Home Service in Step with Sales"—by Miss Jessie McQueen, Home Service Counsellor, American Gas Association, New York.

"The Use of Temperature Statistics in the Gas Business"—by Julian Garrett, manager, Northwestern Utilities Limited, Edmonton, Alberta.

"Showmanship in the Gas Business"—by N. R. McKee, vice-president in charge of sales, Southern Counties Gas Co., Los Angeles, Calif.

"Change-Over to Butane-Air Gas"—by D. E. York, vice-president and general manager, Southern Oregon Gas Corp., Medford, Ore.

"Where Will Future Gas Business Come From?"—by H. M. Crawford, president, Pacific Coast Gas Association, and general sales manager, Pacific Gas and Electric Co., San Francisco, Calif.

"Safety First, and Main and Service Hazards"—by Jacob D. Von Maur, engineer of distribution, Consumers Gas Co., Toronto, Canada.

"Mast Guided Holders—Old and New"—by Fred C. Hill, gas engineer, Central Hudson Fuel Corp., Troy, N. Y.

"Intensive Sales Development"—by W. C. Mainwaring, merchandise manager, B. C. Electric Railway Co., Ltd., Vancouver, B. C.

"If You Don't Tell 'Em, You Can't Sell 'Em"—by James F. Pollard, president, Seattle Gas Co., Seattle, Wash.

"The New C. O. L. Chamber Oven Plant in Vancouver, B. C., and Adaptability of Chamber Ovens to the 'Triple Process' of Manufacturing Coal Gas, Blue Gas and Carburetted Water Gas Simultaneously"—by John Kirkhope, superintendent of manufacture, B. C. Electric Railway Co., Ltd., Vancouver, B. C.

Besides British Columbia's manifold scenic attractions there is much at Vancouver to interest gas men in their regular line of business. B. C. Electric is noted for doing an alert job of both engineering and sales; there are its modern gas plants and its sales rooms to inspect, as well as an "All-Gas Home" erected recently by the company for the benefit of Jubilee visitors.

Mr. Allen will supply further convention information to those desiring it, and should be addressed at 183 Glengarry Ave., Toronto, 12, Ontario.

Calendar

June

American Society of Mechanical Engineers—Dallas, Texas, June 17 to 20.

New England Regional Gas Sales Conference—New Ocean House, Swampscott, Mass., June 18-19.

American Society for Testing Materials—Atlantic City, N. J., June 29 to July 3.

Public Utilities Advertising Association—Annual Convention, Hotel Statler, Boston, Mass., June 30-July 1.

July

Michigan Gas Association—Annual Convention with Michigan Electric Light Association, Grand Hotel, Mackinac Island, Mich., July 6-8.

American Home Economics Association—Olympic Hotel, Seattle, Wash., July 6 to 9.

Canadian Gas Association—Annual meeting, and *Pacific Coast Gas Association*—Northwest Conference, Hotel Vancouver, Vancouver, B. C., July 8-10.

August

Pacific Coast Gas Association—43rd Annual Convention, Fairmont Hotel, San Francisco, August 25-27.

September

American Chemical Society—Annual meeting, Pittsburgh, Pa., September 7-12.

Third World Power Conference—Washington, D.C., September 7-12.

October

American Gas Association—18th Annual Convention, Atlantic City, N. J., week of October 26.

November

American Petroleum Institute—Annual Convention, Chicago, Ill., November 9-12.

Committee On National Advertising

APPOINTMENT of the committee to conduct the gas industry's rapidly-forming national advertising campaign was made last month, members being named as regional representatives following selection by participating companies. Serving on the committee are the following:

C. E. Bennett, president, Manufacturers Light & Heat Co., Pittsburgh, Pa. (Western Pennsylvania, Ohio and West Virginia).

R. B. Brown, president, Milwaukee Gas Light Co., Milwaukee, Wis. (Central West).

Frank D. Cadwallader, vice-president, Boston Consolidated Gas Co. (New England).

B. J. Mullaney, vice-president, The Peoples Gas Light & Coke Co., Chicago, Ill. (Central West).

Henry Obermeyer, assistant to vice-president, Consolidated Edison Co. of New York, Inc. (New York City and State).

J. F. Pollard, president, Seattle Gas Co., Seattle, Wash. (Pacific and Mountain Northwest).

F. J. Rutledge, vice-president, The United Gas Improvement Co., Philadelphia, Pa. (Eastern Pennsylvania, New Jersey and Delaware).

J. S. Spaulding, advertising manager, Los Angeles Gas & Electric Corp., (California).

M. L. Sperry, president, Washington Gas Light Co., Washington, D. C. (Maryland, District of Columbia, Virginia and Kentucky).

J. V. Strange, vice-president, United Gas Public Service Co., Houston, Texas. (Texas, Oklahoma, New Mexico.

T. J. Strickler, vice-president, Kansas City Gas Co., Kansas City, Mo. (Missouri, Nebraska, Kansas and Intermountain States).

W. W. Winter, president, Atlanta Gas Light Co., Atlanta, Ga. (South of Virginia and East of Mississippi River).

T. J. Strickler was elected chairman of the committee by vote of the members, with W. W. Winter as vice-chairman.

First insertions of advertising in the national campaign are expected to begin in September of this year. Formal contracts have been entered into with advertising agencies, McCann-Erickson, Inc., handling details under the committee's supervision for the domestic phase of the campaign, and Ketchum, MacLeod & Grove the industrial-commercial advertising.

Several meetings of the committee have been held to discuss campaign objectives, copy themes, media, and to instruct advertising counsel. The committee recommended that the Association bill all participating companies at the rate of 4 cents per meter in operation as of December 31, 1935, about the middle of June, the first quarterly payment to be due July 1, 1936.

■ ■

Big Phillips Gasser

In Moore County, Texas, Phillips Petroleum Co. has brought in a gas well of 176,000,000 cu .ft. daily potential. The hole was sunk to a depth of 3,270 feet.

AT LEFT—Some of the representatives of Florida companies who met to form the Gas Meters Association.

Florida Companies Form Association

REPRESENTATIVES from a number of Florida gas companies met in Clearwater, Florida, on April 14 and 15 and formed an association to be known as The Gas Meters Association of Florida and Georgia.

The following officers were elected: V. W. Kennedy, Florida Public Service Co., Orlando, president; J. W. Owens, Central Florida Gas Corp., Winter Haven, vice-president; and R. O. Berry, Jacksonville Gas Co., secretary and treasurer. Gas companies represented at the meeting were the Florida Public Service Co., Central Florida Gas Corp., Florida Power and Light Co., St. Augustine Gas Co., Clearwater Gas Co., Ft. Myers Gas Co., Florida Public Utilities Co., Southern Gas and Electric Corp., Jacksonville Gas Co., and Savannah (Ga.) Gas Co.

The purpose of the meeting was to form an organization of all the manufactured gas properties in Florida and south Georgia. It was decided that the association would meet twice a year at some central location in Florida for a two day session in order to exchange ideas and discuss problems on merchandising, distribution, and plant operation. It was also decided to invite all appliance manufacturers to participate in the meetings on the same basis as representatives of the companies. The first meeting will be held the early part of September.

Missouri Utility Men Re-elect President

AT the annual convention of the Missouri Association of Public Utilities, held April 29, 30 and May 1, at Hotel Jefferson in St. Louis, C. E. Mitchel, sales manager of the Union Electric Light & Power Co., St. Louis, was re-elected president of the Association.

C. E. MITCHEL

The other officers elected were first vice-president, Ben C. Adams, Gas Service Co., Kansas City; second vice-president, E. H. Lewis, St. Louis County Gas Co., Webster Groves; third vice-president, Chester C. Smith, Kansas City Power & Light Co., Kansas City; treasurer, Hermann Spoehrer, Union Electric Light & Power Co., St. Louis; secretary, N. R. Beagle, Missouri Power & Light Co., Jefferson City; managing director, E. A. Beer, Jefferson City; assistant secretary, Jesse Blythe, Jefferson City.

The following Executive Committee was elected: E. P. Gosling, St. Louis; L. W. Helmreich, Jefferson City; T. J. Strickler, Kansas City; D. W. Snyder, Jr., Jefferson City; Fred Karr, St. Joseph; O. F. Funk, St. Louis; A. E. Bettis, Kansas City; R. G. Taber, Cape Girardeau.

The association membership includes virtually every privately-owned gas, electric and water utility in Missouri. A total of 237 delegates were registered, of which 68 were women.

Among the speakers on the program and their subjects were "Through the Years in the Gas Industry," L. B. Denning, Dallas, Texas, president of the American Gas Association.

"Welcome to St. Louis," E. P. Gosling, St. Louis Gas Light Co.

"Why Home Service Women?" Miss Frances Weedman, Chicago, Ill., General Electric Appliance Corp.

"A Few Remarks," Louis H. Egan, St. Louis, president, Union Electric Light & Power Co.

"Looking Backward to See Forward," Gardner S. Howland, Chicago, Ill., Commonwealth Edison Co.

"More Safety, Less Accidents," J. M. Strike, St. Joseph, St. Joseph Railway, Light, Heat & Power Co.

"Service," H. T. East, Chicago, Ill., Public Service Co. of Northern Illinois.

An employees' speaking contest was held on the evening of April 29. Employees of utilities throughout the state were eligible. Contestants were chosen by company elimination, six contestants were men, and three were women. First prize for both men and women was $50 in cash, second prize was $25.

The subjects were, for men, "The Utility's Part in the Development of the Community," for women, "The American Home—How the Utilities Help Build It." The winners were, women, first prize, Miss Dolores Milburn, Union Electric Light & Power Co.; second prize, Miss Lillian Butterfield, Central Distributing Co., Kansas City; men, first, Vall G. Herber, Gas Service Co., Kansas City; second, Fred M. Sholders, Kansas City Power & Light Co., Kansas City.

Fred H. Luecke, Warrensburg, Mo., president of the Missouri Public Service Co., presided at the Open Forum held on the evening of April 30. Three subjects were discussed by speakers, followed by questions from the floor. The subjects were "Hazards to Water Supply Due to Faulty Plumbing," "Outdoor Metering," and "Rental or Trial Period Experience with Load Building Appliances."

■ ■

Bostwick to Head P.C.G.A. Convention Committee

PACIFIC Coast Gas Association President H. M. Crawford has appointed Henry Bostwick general chairman for the 43rd P.C.G.A. Annual Convention which will be held August 25 to 27 at the Fairmont Hotel in San Francisco. Mr. Bostwick is past-president and past-secretary of the P.C.G.A., and as general chairman will head a committee comprised of the following: C. B. Babcock, in charge of entertainment; Frank Talcott, reception and attendance; E. J. Hinchey, golf tournament; E. C. Wood, transportation; Jean Frickelton, publicity; Wayne Clark, registration; F. J. Southerland, properties; W. A. Worthington, hotel accommodations; A. C. Joy, Convention newspaper; B. W. Reynolds, banquet. Mrs. Crawford will be Convention hostess.

HENRY BOSTWICK

The business program of the Convention will be handled by a program committee under the chairmanship of E. G. McCann, who is chairman of the Association's educational committee. His program committee is composed of the following: L. E. Green, Accounting Section chairman; W. J. Bailey, Manufacturers; W. M. Jacobs, Sales and Advertising; P. E. Beckman, Technical; and Alma Freeburg, Women's Committee chairman.

■ ■

Lawder Is Promoted

Robert A. Lawder, formerly assistant manager of the house heating and air-conditioning division of the Consolidated Edison Co. of New York, has been appointed to sales-promotion manager, a newly created position.

Mr. Lawder has been active in the company since 1931, when he was first a salesman in the house heating division. He was transferred to the East River Gas Co. in 1932 as sales supervisor, and the following year he became a retail district supervisor. In July, 1935, he was promoted to the position of assistant manager, which he held until his recent promotion.

A Prediction ·

THE FIRST QUARTER OF 1936 WAS HIGHLY SUCCESSFUL FROM THE STANDPOINT OF BOTH GAS AND ELECTRIC APPLIANCE SALES. THE TOTAL VOLUME OF BUSINESS (DEALER AND P. G. and E.), WAS GREATER THAN ANY PREVIOUS FIRST-QUARTER IN HISTORY.

Now the question looms: What are the possibilities for the rest of 1936? We have given the matter considerable study, and the facts, we are glad to say, inspire the heartiest kind of optimism. One thing that stands out is the lower cost of gas and electricity to the consumer. Our recent rate reductions will aggregate $6,500,000 per year. Of this amount, our domestic customers will save $3,500,000. Where the average domestic customer has been paying $67.20 per year, he will now pay only $59.81 for the same service. This saving of $7.39 amounts to slightly more than 11%. If the customer re-invests this money in additional service; in other words, if he puts new appliances to work that bring his bill up to the old figure, he will save not 11%, but 20%. Naturally, we're going to point this out. And so should you, for it is a potent selling argument no matter what kind of appliance you sell. In many cases, your prospect will be one of our better-than-average customers. His yearly saving might easily be two or three times $7.39. In a case like that, the difference between 11% and 20% would be a real consideration. But even when your prospect is a minimum user, the saving is worthwhile to him and you do him a favor when you point it out. Incidentally, when you're talking operating costs, we suggest that you emphasize what the appliance will do for a penny, a nickle or a dime. Or the other way round: What the appliance costs per day, per hour, per meal, per washing, or whatever unit fits the case.

To help you do this we put out the Electric Cost Indicator Wheel. Soon we will have a similar device to help you capitalize on the new gas rates. Finally, remember: The new, modern styling and the new improvements and refinements that make the up-to-the-minute appliances so attractive are all things that speak for themselves. The new economy-of-operation, on the other hand, must be explained. Talk it up. Use homely, everyday comparisons to prove the trifling cost of gas and electric servants. Then, just watch the customers go BUY!

P·G·and E·

PACIFIC GAS AND ELECTRIC COMPANY

Owned · Operated · Managed by Californians

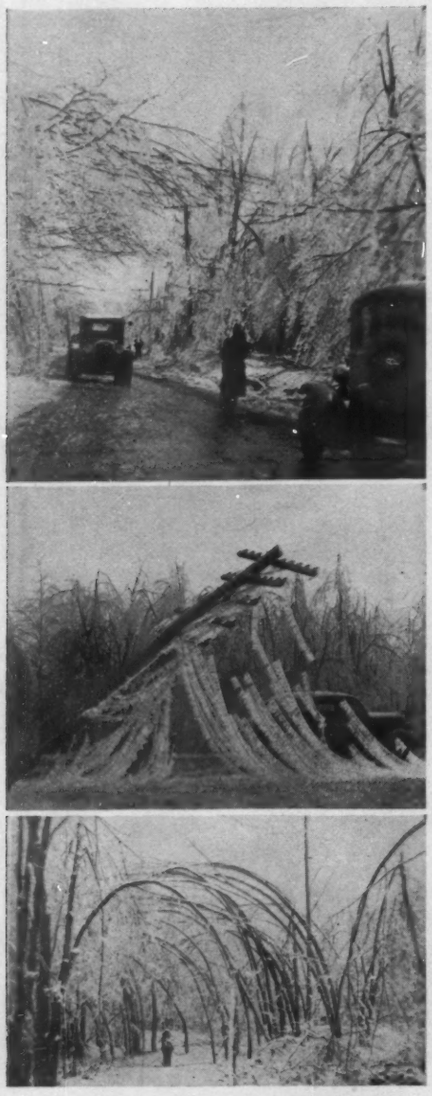
G206-636

"The St. Patrick's Day Storm" on the United Natural Gas Co. System

By J. G. MONTGOMERY, Jr.
United Natural Gas Company

A GREAT deal has been heard about the Pennsylvania gas industry's fighting floods and about how the gas companies met the emergency. Practically all of the reports have been on experiences with high water. The fact that other emergencies existed at the same time may not be generally known.

What might be termed the "St. Patrick's Day Storm" was eclipsed by the reports of floods, loss of life, loss of property, food and fuel shortage, and general suffering in the low-lying districts such as the Johnstown and Pittsburgh areas. These conditions and related emergencies were headline items in all the newspapers of the United States.



Typical scenes on the United Natural Gas Co. system after the "St. Patrick's Day Storm."

At the same time that our neighboring operators were fighting the high water emergency, other operators who perhaps were considered more fortunate by being located on higher ground, had troubles of their own with which to contend.

The St. Patrick's Day storm consisted of a heavy fall of rain, snow, and sleet which, added to the exceptionally heavy accumulation of snow throughout the winter, created flood conditions in all the lowlands. The snow and sleet fell so rapidly that highways in some sections were entirely blocked, due to the inability of the highway cleaning apparatus to cope with the condition. In other sections rain and sleet froze, making the highways that ordinarily were free from snow so hazardous that traffic was blocked.

In the still higher localities, sleet and rain froze as it fell on trees, buildings, telephone and telegraph lines and poles to such an extent that wires and twigs as small as a lead pencil were coated with ice to as much as 2 inches in diameter. The unprecedented accumulation of ice, while very beautiful and spectacular to look at, resulted in a condition that the gas companies as well as the general public had never before been called upon to meet. Nearly all telephone and telegraph wires and poles were demolished completely. Only the newest of the poles could withstand the excessive weight. Tree tops were bent to the ground and broken. Trees of from 2 to 4 feet in diameter at the base were uprooted by the tremendous weight of ice.

The damage to timber was not done generally by wind, but any tree that was not standing nearly straight became top-heavy and eventually fell under the accumulated weight. In some areas where approximately 2 feet of snow existed, the tree branches and tops were bent to the ground, where they froze into the snow. Rights-of-way on main lines, field lines, all lease roads, and many highways were completely blocked by fallen timber, broken tree tops, over-hanging branches, telephone poles and entanglement of wires.

This description of the storm and its results may appear to have little connection with natural gas operation. It is an attempt to portray the utter lack of communication by either telephone, telegraph, automobile, or foot travel.

The production, transmission, and distribution of gas requires the coordinated efforts of individuals and groups through systems of telephone and telegraph; it requires well handling, station manipulation, and pressure regulation as exact as the dispatching of a great number of railroad trains over a busy trunk line system. Frequent communication with each unit of the companies' properties is absolutely necessary.

When the storm hit, instead of having at least hourly communication with the fields, stations, and markets, not a single line of communication was left. Telephone and telegraph, radio, and even personal messenger failed. Attempts at short wave communication and police radio systems were only partially successful. As soon as news services and commercial communication discovered that the amateur radio operators were successful in contacting outside sources, their stations were so swamped with messages that gas company communication through these channels was practically impossible. Immediately the job of making telephone and telegraph contacts was undertaken. Twisted wire was strung along the highways through trees, along fences and highway guard rails to establish a temporary circuit.

The matter of regulating wells as the demand required, the starting and shutting down of compressors, anticipating weather conditions and resulting demand, the discovery and repair of broken lines, the turning on of additional supply in order to offset bleeding of systems from broken lines, were some of the difficulties encountered that even under ordinarily good wire communication would have been quite troublesome. These emergencies were all taken care of without any contact. Only through the efforts and resourcefulness of individual employees of the different units, who worked long and hard under extreme and hazardous conditions, was adequate service maintained.

Among some of the instances that may be interesting to note were the complete blocking of rights-of-way and least roads by falling timber; well tenders became completely lost and bewildered while trying to find the wells and lines when only 10 feet from their objective; the fall of timber on the deep snow obliterated all trace of roads or rights-of-way, producing an effect of sameness throughout the entire wooded sections.

Work of removing the debris and clearing lines, roads and rights-of-way was started at once. Large pieces of ice and broken tree tops constantly falling created hazardous working conditions. Trees were bent to such an extent that in chopping a broken branch the main tree was likely to whip up before the workman had time to avoid it.

High water caused considerable damage. A blow-off valve of a drip opened due to high water and resulted in the loss of more than 10 million cubic feet of gas before it could be closed. Pipe lines were washed away, necessitating the construction of emergency lines over bridges. Repairs to pipe lines and communication systems progressed slowly, due to the difficulty of transportation through the wooded areas.

To maintain adequate service in an emergency as serious and wide-spread as created by the storm is a tribute to the efficiency and resourcefulness of the individual gas company employees.

■ ■

Merriman Lynchburg Manager

The appointment of Charles W. Merriman of Roanoke, Va., as manager of the Lynchburg (Va.) Gas Co. has been announced by Stone & Webster, Inc. Mr. Merriman is a former manager of the Georgia Public Utilities Co. of Rome, Ga.

No Complaints!

BLAW-KNOX GAS CLEANERS

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assuring continuous delivery of dry, clean gas. The original cost is reasonable—the operating cost is negligible.

One large central states gas company (name on request) found that in nine months operation the amount of oil used per million feet of gas cleaned amounted to only 97/1000 gallons—a cost of .00174 cents per M feet. The dust removed amounted to 5500 lbs.

Another company passing mixed coke oven and refinery gas used only 95/100 gallons of oil per million feet of gas cleaned—a cost of .0171c per M feet. Dust removed amounted to 2/3 to 1 barrel each week.

An investment in ***Blaw-Knox Gas Cleaners*** is an investment in ***freedom from service complaints—continuity of service and customer satisfaction,*** all dividend payers.

Complete details on request without obligation—write

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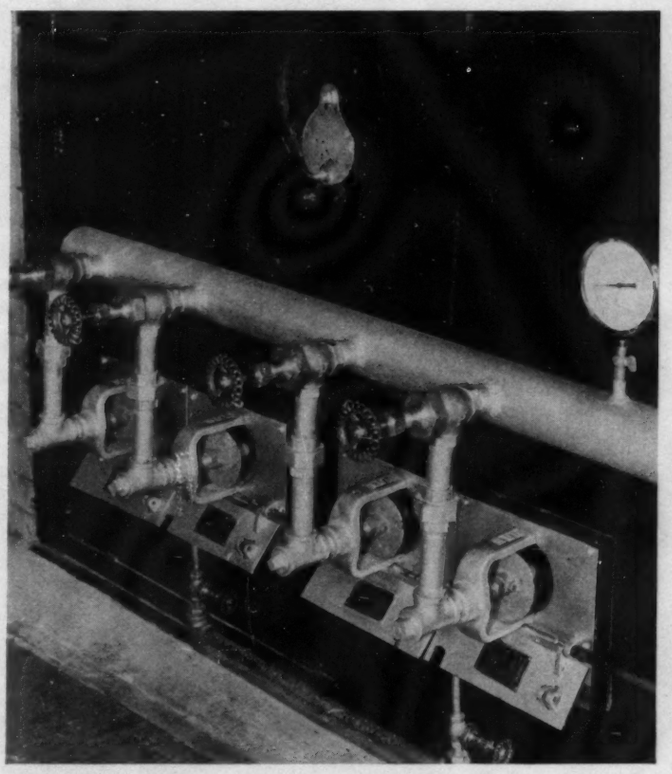


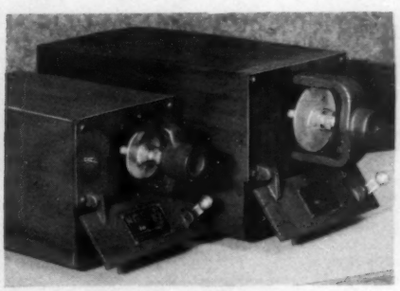
Installation photograph above shows adaptability of N. G. E. Nos. 10-B and 11-B to boiler installations. Louvre doors and adjustable shutters provide either automatic or manual control of both secondary and primary air. Operation is quiet and vibration-free at at all loads. Safe to light and operate. *Write for literature.*

N.G.E.

NOS. 10-B AND 11-B VENTURI TYPE GAS BURNERS

In the N. G. E. Nos. 10-B and 11-B venturi gas burners gas companies have found the ideal solution to the problem of converting large industrial boiler plants to natural gas.

These compact, efficient, economical units may be readily installed in existing boiler fronts with a minimum of time, effort and expense.



N.G.E. No. 10-B (left) and No. 11-B (right) burners are identical except for size.

NATURAL GAS EQUIPMENT, INC.

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GENERAL CERAMICS COMPANY

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For Conversion Burners, Circulating Heaters, etc.

Because they are uniformly accurate, strong, and dependable in every way, General Ceramics Refractories are used by most of the leading manufacturers of gas heating appliances. • Our engineers will gladly cooperate with you.

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The Goodman Stopper

The Reliable Shut-off for Street Mains

Equipped with Improved Patented Locking Sleeve, which locks both handles to the pipe. Stopper cannot slip. Gas cannot pass.

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For every firing and controlling requirement including a full line of the finest conversion burners ranging in price from 7.50 to 150.00.

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Pioneers in the manufacture of scientific carburetting equipment for developing efficient, dependable and economical power for all requirements.

Adapted to all types of multiple cylinder stationary engines.

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NATURAL GAS CARBURETOR

Past performance in hundreds of installations has proved the economy and efficiency of this **natural gas** carburetor. Minimum fuel consumption—the keynote of its design—means consistent dollar saving. Combined with such features as easy, no-prime starting, smooth operation, no floating parts and accurate control, the Ensign Carburetor assures unlimited satisfactory service.

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Write for detailed information.

Pipe Line Hydrates

(Continued from Page 20)

ature and pressure of the apparatus favor their formation and to melt quietly when the temperature and/or pressure are changed slowly to favor their decomposition. If, however, the pressure is decreased rapidly a large portion of the hydrate mass melts quickly, with obvious sputtering of the melting hydrate as the gas is released from it. Some hydrate usually persists until after the apparatus is fully depressured. When the hydrate is formed in the apparatus without agitation of the water present, crystals form that are clear like ordinary ice; when the gas is bubbled through the water or the water is agitated by other means, a snowy mass of hydrate forms which is obviously porous and much like the hydrate usually removed from pipe lines.

Hydrates existing in natural gas pipe lines consist of a mixture of several kinds of hydrates formed from the various hydrocarbon constituents. Hammerschmidt found that for every temperature there is a fairly definite pressure at which hydrates formed by natural gas will melt. His experiments also indicate that, within limits, hydrates will form at these same conditions of temperature and pressure. He reports that in his laboratory experiments hydrates were not always formed when the temperature and pressure conditions appeared to favor their formation. Other factors, not now fully understood, apparently play a part in hydrate formation.

Location of Hydrates in Pipe Lines

The second question of interest in a discussion of gas hydrates is: Where do they form in the pipe line? At the outset of the Bureau's study a number of the larger pipe line companies were visited to obtain first-hand information regarding their experiences with freeze-ups due to hydrates. Particular inquiry was made as to the location of the freeze-up, the temperature of the line, suspected causes, and methods used in freeing the line. From these contacts it was learned that it was a rather common experience to find that plugging occurred in the pipe on the rise out of a sag in the line. In some instances the free-ups were well up on the side of the rising slope, sometimes just beyond another depression in the line but near the top of the hill.

The Bureau's plans for the study of gas hydrates include a pipe line temperature survey to give information relative to the temperature of the gas, the temperature of the pipe, the surrounding ground temperature, and the weather temperature in the region of the test. The Bureau is at present carrying on its survey along the 22-inch Amarillo-Denver pipe line operated by the Canadian River Gas Co. in Texas and by the Colorado-Interstate Gas Co. in New Mexico and Colorado. This line operates at a pressure of 250 to 350 lbs per sq. in. The author wishes to express the Bureau's appreciation to the engineers and management of these companies for the enthusiastic cooperation and very material assistance given.

The temperature of the gas in the pipe line is, of course, an important factor as to

whether trouble from hydrate formation can be expected. The pressure of the line is, likewise, an important factor. If the gas is saturated with water at the warm temperature at which it leaves the compressor station some of the water it carries in vapor form will condense as the gas is cooled by the lower ground temperature. The temperature difference between the gas and the ground will be greatest near the compressor station, resulting in a relatively large temperature drop; hence a large portion of the water will be found to condense fairly close to the station. While the condensed water and high pressure in the pipe line close to the station are factors in favor of hydrate formation, the higher temperature of the line is an offsetting factor and in practice is the controlling one. Data on the Amarillo-Denver pipe line show that the gas, after leaving the gasoline plant at Bivins compressor station, travels 20 to 30 miles before reaching ground temperature.

After the gas has traveled a considerable distance the lowered pressure, due to flow of the gas, is less favorable to hydrate formation. If the ground temperature, and consequently the gas temperature, become sufficiently cold there is a possibility that conditions will favor both the condensation of water and the formation of hydrates. Generally speaking, however, the most likely place to find hydrates in a pipe line is the central portion of the line between compressor stations. So far as the Bureau's engineers have been able to learn this is borne out by experience.

Overcoming Hydrate Freezing

The third question that naturally arises is: What can be done to prevent the formation of hydrates; or, if a freeze-up occurs, what can be done to get rid of it? In order to have hydrates, it is necessary first to have water somewhere in the pipe line, hence an obvious means of preventing the formation of hydrates would be to remove all water from the line, and then dry completely all gas entering the line. This may not be possible for some lines and may be economically impracticable for many others. It may not be necessary to dry the gas completely, for Hammerschmidt points out that if the gas is dried until its dew point is lower than the temperature existing in the pipe line hydrates will not form. Of course, hydrate freezing might still be a source of trouble in meter runs and in regulator stations, since temperatures above ground may be below the dew point, and the throttling effect may reduce the temperature of the gas sufficiently to cause hydrates to form unless all the water is removed.

If a pipe line becomes plugged or partly plugged with hydrates the most urgent question is: How can the line be freed? With a general knowledge of the nature of gas hydrates and their physical properties a few practices immediately suggest themselves. As would be expected, the usual methods employed by pipe line operators fall into this group. First, since the very nature of the plugging is one of freezing, some means of heating the gas to thaw the plug is a logical one to try. Where the plug can be located definitely a common practice is to uncover the line and apply heat directly to it by building a fire in the trench, using whatever combustible material is readily available. This method frequently is very effective in freeing the line. It does not, of course, remove the cause of the trouble but may result in redistribution of the water in the line so that no further serious plugging may occur. If a drip or blow-off is conveniently close at hand, this method may permit the water from the melted hydrate to collect and be purged from the line.

A second method, sometimes used, is to introduce into the line some material that will dissolve the frozen hydrate and produce a solution that remains liquid at the pressure-temperature conditions of the pipe line. Alcohol has been most commonly used and seems to have been rather effective. Calcium chloride solutions have been employed by some organizations, and one company has tried using ammonia gas, both for freeing a plug in the line and for inhibiting hydrate formation. Just how effective this last method is cannot be said.

A third method that has been found effective whenever circumstances permit its use is to reduce the pressure on the line to the point where the hydrate plug becomes unstable and melts at the temperature prevailing in the pipe line. To do this it is sometimes necessary to blow the line down to atmospheric pressure. In other cases, experience has shown that partial stoppage of a pipe line may be relieved by operating the line at a pressure below that corresponding to the melting point of the hydrate at the temperature of the line.

From the foregoing discussion it is apparent that many factors are involved in the relation of gas hydrates to pipe line operation. While the work of Hammerschmidt and his associates is a notable contribution to present-day knowledge of gas hydrates, they have found practical answers to their immediate problems and have decided to discontinue their investigations. The Bureau of Mines, in cooperation with the American Gas Association, is pleased to take up the work at this point with the intention of making a general study of the problem. The Bureau's work has just started. To make the results obtained of most value, the Bureau hopes to have the industry's cooperation. Those working on the problem would like to know about pipeline companies' experiences with freezing troubles and will be especially pleased to have operators indicate which phases of the problem are of greatest interest to them.

■ ■

Stevens Made Assistant Comptroller

W. R. Stevens, general auditor of the Lone Star Gas Co. and affiliated companies, was recently appointed assistant comptroller for the system. Mr. Stevens entered the service of the Lone Star System in 1926 when he was hired as an accountant by Community Natural Gas Co. On January 1, 1927, he was made chief clerk of the commercial department of Community Natural, and on May 1, 1932, was appointed general auditor for the system.

BUILD YOUR HOUSEHEATING LOAD WITH KLIXON CONTROLS

These two advanced Klixon devices give exact automatic temperature control and assure positive pilot protection for your gas-fired space heaters . . . provide sales features that make it easy to sell gas heating.

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Payne

Gas Heating Equipment Meets Every Requirement

For twenty-two years Payne engineers have worked in the production of gas-fired heating equipment exclusively. Advertising and selling activity has been concentrated on GAS HEATING. The purpose of the entire Payne organization has been undivided in their efforts to assist in the development of the gas heating industry.

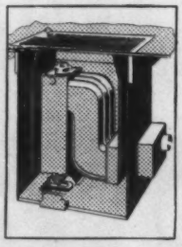
Payne products naturally reflect a thorough understanding of the requirements for efficient gas heating equipment. The in-built quality in Payne Furnaces is an asset to the merchandiser of gas appliances. Each Payneheat System sold goes right to work creating a steady demand.

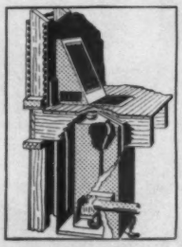
Build Goodwill!

Make a friend of every customer. The sale of a Payneheat System will do just that. Every merchandiser of gas heating appliances will recognize the value of such a friendship.

It's worth remembering . . . If it can be heated with *Gas*, it can be *Payneheated!*

Write for full particulars regarding the Payne line of Gas Heating Units.





PAYNE

Furnace & Supply Co.

338 N. FOOTHILL ROAD
BEVERLY HILLS, CALIFORNIA

Hendee Takes Executive Post with Colorado Interstate Gas Co.

ROBERT W. HENDEE has resigned as President of Oklahoma Natural Gas Co., effective June 1, to accept an executive position with the Colorado Interstate Gas Co., Standard Oil Co. of New Jersey affiliate, having its main office in Colorado Springs, Colo. Colorado Interstate maintains more than 700 miles of pipe lines from the Panhandle of Texas to Pueblo, Colorado Springs, Denver, and other Colorado cities.

ROBERT W. HENDEE

Mr. Hendee has been an officer of Oklahoma Natural for the past 15 years and has a background of civic and gas industry service. He is active in the affairs of the American Gas Association's Natural Gas Department, being a member of its Managing Committee. He also is serving on the general committee on natural gas production problems, the sub-committee on gas well deliveries, and the pipe line sub-committee.

A. E. Bradshaw, chairman of the board of Oklahoma Natural, in commenting on Mr. Hendee's resignation, expressed keen regret on behalf of the company in losing his counsel.

■ ■

Panhandle Eastern Lets Contracts for Compressor Stations

PANHANDLE Eastern Pipe Line Co. has awarded contract for the construction of a number of compressor stations and for additions to existing stations along its main carrier which will deliver natural gas from the Texas Panhandle to Detroit, according to J. F. Curry, vice-president and general manager of Panhandle Eastern. Construction of compressor stations at Greensburg, Haven, and Olpe in Kansas, and at Stinnett, Texas, has been awarded to the Fluor Corp., Los Angeles; while construction of stations at Houstonia and Centralia, Mo., and at Pleasant Hill, Ill., has been awarded to Arthur G. McKee & Co., Cleveland. Additional equipment is to be installed in Panhandle Eastern's existing station at Liberal, Kan. Work was begun on these projects early last month.

The Cooper-Bessemer Corp. is supplying engines totaling 17,600-h.p., consisting of twelve 1,300-h.p. units, two 1,000-h.p. units, and auxiliary units.

■ ■

Gas Industry Represented at Safety Conference

A PACIFIC Coast Safety Conference was held at the Biltmore Hotel, Los Angeles, Calif., May 28 and 29, 1936. The gas industry was represented on the speaking program by S. C. Dickinson, chief safety engineer, Pacific Gas and Electric Co., San Francisco, and Wm. Henderson, superintendent of gas distribution, Los Angeles Gas and Electric Corp.

Mr. Dickinson, under the title of "Stunts for Keeping a Safety Program Alive," described his company's methods of promoting safety by constant supervision of safety precautions, and gave statistics of reduction of accidents resulting therefrom.

Mr. Henderson, discussing "Safe Practices in Entering Tanks and Manholes in the Gas Industry," listed the hazards attendant to entering manholes, not the least of which is vehicular traffic, and described instruments and procedures used to detect and remove explosive gases that may be present in underground structures.

■ ■

Tri-County-Grand Rapids Gas Light Transmission Line Progressing

Construction on the Grand Rapids (Mich.) Gas Light Co. 10-inch, 45-mile natural gas transmission line from the Hinton-Millbrook-Belvidere fields which was begun in the latter part of April, is progressing steadily, according to Albert G. Schroeder, vice-president. About 230 men divided into 15 crews are working along the right-of-way which traverses rough, hilly and swampy country. Construction is progressing at the rate of about 1⅛ miles per day. The line will have a daily capacity of 18 million cu. ft.

Two-Stage Combustion of Natural Gas

(Continued from Page 17)

more luminous and opaque. In fact, the dense cloud of molecular free carbon carried in suspension in the flame gave it an appearance approaching that of a powdered coal flame. It was heavy and hovered low in the furnace, sweeping the surface of the glass. The density and radiant character of the flame was easily controllable and subject to the amount of free carbon which was produced in the process. Best results, however, were obtained with the densest, most radiant flame which conformed with our original theory. With the burners in their best adjustment visibility through the furnace was completely obstructed. Natural gas as previously applied to this same tank in the conventional manner produced a flame which was light and almost transparent with a tendency to float high in the furnace.

The effect of increased radiant energy was immediately reflected in the operation of the furnace. Fuel consumption per ton of glass melted was decreased about 10 per cent. Higher rates of production resulted; in fact, during one 24-hour period flint glass was melted at the rate of 1 ton glass per day per 6.05 square feet melter area, which is considered to be a record pull for this type of furnace. All of this was accomplished without raising the temperature of the crown of the furnace or making any radical changes in the structure of the furnace. The furnace can be operated on either producer or processed natural gas by the mere opening and closing of valves.

Open Hearth Furnace Application

It is hoped that we will have an opportunity to design the application for and apply processed natural gas to an open hearth furnace. It is believed that this process offers the best method of firing such high temperature regenerative furnaces with natural gas. The cost of such an application is very small and the full fuel value of natural gas can be realized as it can in no other way. The application can be made to furnaces previously fired with producer gas or oil. The design of these processing units has now been developed to the point where we can predict accurately what result can be expected and can produce various flame types suitable for particular operations. There appear to be many applications of this process which have not been discussed in this paper. The ability to give natural gas a highly luminous flame presents many opportunities for improvement in the firing of all kinds of metallurgical and industrial furnaces such as soaking pits, glass tanks, open hearth furnaces, ore roasting furnaces, zinc retort furnaces, billet and ingot reheating furnaces, copper smelting reverberatory furnaces, skelp furnaces, continuous strip mill furnaces, etc. Still another possibility for the use of processed gas which is receiving consideration is control of atmospheres in continuous heating furnaces, as in certain carburizing, pair and pack heating, annealing and normalizing operations. A controlled reducing atmosphere can be maintained in any furnace with or without free carbon in suspension, as desired.

The process appeals to the consumer as an easy way to apply natural gas to his furnaces. He need not even shut them down. He can produce furnace conditions exactly similar to those obtained with producer gas. There is no costly experimental period and no radical changes to be made in the existing furnace or operating methods. He is in the position of being able to take advantage of favorable natural gas prices offered for an off-peak supply of natural gas. He has

SALESMAN WANTED

An excellent opening for an experienced gas burner salesman capable of handling a complete line of burners for the manufacturer. Must be fully qualified and experienced.

NEMEC COMBUSTION ENGINEERS
319 West Whittier Blvd. Whittier, Calif.

HYDRAUGER

MODERN HORIZONTAL BORING MACHINE

For Underground Installation of Pipe and Conduits. Avoids damage to costly pavements and saves time. Send for Bulletin.

HYDRAUGER CORPORATION, Ltd.
116 New Montgomery St.
San Francisco, Calif.

PGR

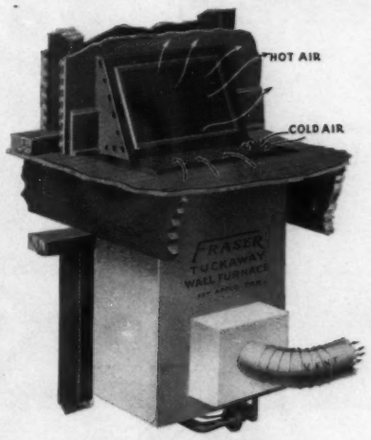
PACIFIC
Gas Heating Appliances

- Circulator Heaters
- Radiant Wall Heaters
- Gas Steam Radiators
- Floor Furnaces
- Gravity Furnaces
- Blower Furnaces
- Unit Heaters
- Forced Air Units
- Water Heaters

Write for Catalog No. WG-3

PACIFIC GAS RADIATOR CO.
Huntington Park, Calif., U.S.A.

FRASER
TUCK-A-WAY



An entirely new idea in Furnace Construction
Made in 4 sizes

Manufactured by
Fraser Furnace Company
Stockton, Calif.

Distributed by
H. R. Basford Company
San Francisco Los Angeles

NO-OX-ID
IRON-RUST
TRADE MARK
The Original Rust Preventive

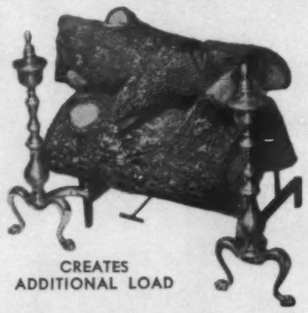
Stop Corrosion in Services

NO-OX-ID and NO-OX-ID-IZED Wrapper may be machine applied and delivered to job for protection of pipe through cinder fills and bad soil conditions, which answers the ever present problem of corrosion in services at junctions of foundation walls. NO-OX-ID may also be applied to services by the hand method at the time of installation.

Inquiries invited.

DEARBORN CHEMICAL COMPANY
Los Angeles: 807 Mateo Street, Phone TRinity 3385
San Francisco: 421 Bryant St., Phone SUtter 8688

ODORLESS



CREATES ADDITIONAL LOAD

GLO-FIRE

"THE APPROVED GAS LOG"

The double burning action caused by introduction of pre-heated secondary air mixing with burning gases within the combustion chamber allows no unburned gas to escape.

Glo-fire is a circulating heater that requires no venting. In two sizes: 24 inches long, hourly input 28,000 B.t.u., and 20 inches long, hourly input 17,500 B.t.u.

EXCLUSIVE DISTRIBUTORS

Colonial Shops

DISTINCTIVE FIREPLACE FIXTURES

GLO-FIRE SALES DIVISION

3350 WEST FIRST STREET
LOS ANGELES, CALIF.

REDUCE
Operating Cost
— WITH —
SPRAGUE METERS
— AND —
SPRAGUE REGULATORS

SPRAGUE METER COMPANY
Bridgeport, Conn.
Los Angeles-San Francisco, Cal.

U. S. SUPER de LAVAUD CAST IRON PIPE

"Cast without chill in a metal mold"

U. S. PIPE AND FOUNDRY COMPANY
Burlington, N. J.

PORCELAIN ENAMEL INSTITUTE, INC.
612 NORTH MICHIGAN AVENUE • CHICAGO

Please send me, absolutely free, a copy of your new, easy-reading, profusely illustrated sales manual on Porcelain Enamel.

Name_____

Firm_____

Address_____

his producers as stand-by ready to run in the event, however remote, of the interruption of natural gas service. There are many advantages over producer gas such as:

1. No heavy moving parts, reducing mechanical maintenance costs and power requirements.
2. No steam or water required; no water jackets.
3. Lower operating temperatures; long life for refractories.
4. No fluxing and erosion of lining; elimination of shut-downs for extensive cleaning and patching inside generator.
5. No coal or ash handling.
6. No fly ash and dirt in product, gas conductor pipes or burners.
7. No labor in attendance; process can be made entirely automatic.
8. Higher overall thermal efficiencies; 95 per cent as compared with 80 per cent for a first-class producer gas generator.
9. Gas produced at a more constant rate, constant pressure, uniform quality and output is instantly adjustable.
10. Processing units are smaller and cheaper than producers, B.t.u. output is roughly twice as great as for a producer gas generator of same diameter.

The process offers the gas company the possibility of developing another market for fuel gas on either a firm, interruptable or off-peak basis as conditions and prices dictate. It places natural gas in a strong competitive position with producer gas and obviates the absorption in the price of natural gas of costly furnace changes necessary to obtain maximum efficiency if natural gas is applied in the orthodox manner.

It is believed that this development will enlarge the market and increase the value of natural gas. It has passed the experimental stage. One unit has been in continuous operation for two years and another for more than five months. We have had many visitors both from the industry and from interested potential consumers. We will welcome many more. The Mississippi River Fuel Corp. has pioneered this development and it is hoped that our experience will be of real value to the whole industry.

■ ■

Thawing Gas Mains

(Continued from Page 18)

In one instance we had a rather unfortunate experience. We were attempting to thaw a gas service. One cable was connected to the service pipe in the house and the other cable to a drip stand pipe, directly in front of the house. This apeared to be an ideal connection, as it included some 75 feet of 1¼-inch pipe; about 6 or 8 feet of 3-inch main and then about 15 feet of 1¼-inch drip stand pipe. The energy was turned on at 60 volts and the ammeters showed very little energy flowing, so the primary coils of the transformers were connected for 115-volt secondary. The ammeters then indicated approximately 600 amperes on the secondary side. After about 20 minutes the pipes were quite warm, so the cables were removed and much to our surprise, water started flowing out of the drip stand pipe. Upon investigation we found that the 1¼-inch drip pipe crossed over the top of an 8-inch cast iron water main and the arc had burned a hole about 3 or 4 inches long in the 1¼-inch pipe and

about a ⅜-inch hole through the 8-inch cast iron pipe. This, of course, is one of the difficulties that might be experienced where the gas and water pipes are in contact, or in close proximity.

As soon as convenient, we hope to do some laboratory testing and experimenting in an endeavor to determine whether or not it is practical to use this method, in view of the difficulty experienced with the water system. We feel, however, that even though this problem may be encountered occasionally, it will only happen perhaps once in several hundred times and may not offset the advantages offered by this method.

■ ■

Mustard Appointed Bristol Manager at Detroit

L. E. MUSTARD

ACCORDING to announcement of the Bristol Co., Waterbury, Conn., L. E. Mustard has been appointed district manager of the company's branch office in Detroit. To his new duties, Mr. Mustard brings considerable experience in the application of automatic control to industrial operations.

Born and raised in Michigan, Mr. Mustard attended the University of Michigan, and started his business career with the Westinghouse Electric and Manufacturing Co., East Pittsburgh. He joined the sales and service organization of the Bristol Co. in 1923, and in the year that followed was associated with the Pittsburgh, Denver and St. Louis offices. During the past three years he served as sectional sales and service engineer with headquarters in Dallas, Texas.

■ ■

P. G. and E. Earnings Up

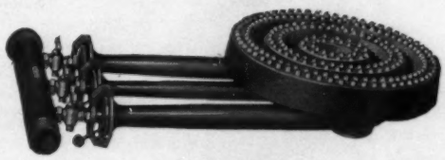
Pacific Gas and Electric Co. gross operating revenue for the 12-month period ended March 31 increased $4,540,681 for a total figure of $93,688,474, and, according to James B. Black, president, the gas department is responsible for most of the increase in revenue. Net earnings after allowance for income tax, bond interest and gas revenue in dispute, amounted to $22,185,580, an increase of $3,964,234 over the preceding 12 months, which is an earning of $2.25 per share of common stock as against $1.62 per share last year.

■ ■

New Wedgewood Burner

The James Graham Manufacturing Co., maker of the Wedgewood gas range, announces that its 1936 models are equipped with Speed-Plus-Simmer burners which provide an unusually wide range of cooking speeds. Inside the outer ring of each burner is a smaller simmer burner that, at the proper position of the valve, operates alone while the main burner remains inoperative. A temperature of from one half to one fourth the lowest obtainable on the usual type burner is claimed for the new Speed-Plus-Simmer burner.

JOHNSON 40 ABC ATMOSPHERIC RING BURNERS



The 40 ABC is a unit made up of three independent ring burners which may be used singly, in pairs, or in triple. Made of smooth grey iron castings with two rows of raised gas port holes. Efficiency and long life are assured by providing each burner flame with an ample quantity of secondary air. Many other features make the 40 ABC an outstanding burner unit. Write for free catalog.

JOHNSON GAS APPLIANCE CO. Cedar Rapids IOWA

Western Representative: C. B. BABCOCK CO. 135 Bluxome Street San Francisco, Calif.

Eastern Representative: J. H. McPHERSON 250 Stuart Street Boston, Mass.

YOU can save TIME and MONEY with the GREENLEE Hydraulic Pipe Pusher

▼▼▼

The Greenlee Hydraulic Pipe Pusher is self-contained. It operates on a notched steel base, so that it is necessary to reset the pipe clamp only every 4 to 7 feet, depending on the length of base used. By taking advantage of hydraulic pressure, this tool has been made very compact and easy to operate. One man, standing in a comfortable position, can exert the maximum pressure of 40,000 pounds on the pipe clamp. Capacity is provided for pipe from 1¼ to 4-inch.

▲▲▲

It doesn't make much difference how the underground installation of pipe has been made, in order for the Greenlee Hydraulic Pusher to show real savings. It does away with much trenching, backfilling, tamping, etc.; it saves tearing up lawns and pavement; and it shows a time and labor saving over the pushers that require several men to operate them when difficult soil is encountered. All that is necessary with the Greenlee is to make a trench long enough to accommodate the pusher with a section of pipe, and one man can furnish sufficient power to send it where it is wanted, simply by pumping the levers. It is easily set up, and there are eight speeds provided for varying soil conditions.

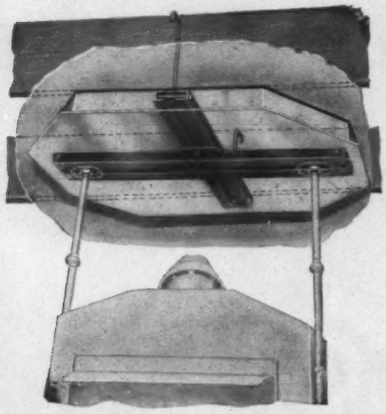
GREENLEE TOOL CO.
1700 Columbia Ave.
ROCKFORD, ILLINOIS

LET US SEND COMPLETE DETAILS

GREENLEE TOOL CO., 1700 Columbia Ave., Rockford, Ill.
Please send complete details on the Greenlee Hydraulic Pipe Pusher.

Company .....
Address .....
City ..... State .....
By WG6-36

LESS VIBRATION
Reduced Installation Cost



Rubber cushions located at vital points on this Inland Unit Heater hanger make units practically noiseless and vibrationless. Installation costs, too, have been reduced to a minimum. It is designed for the suspension of all sizes of gas unit heaters from ceilings and roof joists. The heating unit may be rotated at any angle on a horizontal plane. An aluminized 24-gauge steel canopy is provided where hangers are to be concealed. Use of this canopy gives the installation a neater, cleaner appearance. Write for illustrated folder.

INLAND
GAS SPECIALTIES

INLAND MANUFACTURING COMPANY
(Dept. 2) 1120 North Cicero Ave., Chicago, Illinois

THE
I'M ROBERTSHAW
OVEN-HEAT-CONTROL
ROBOT DIAL
You'll find me on this gas range
When you turn me to the oven temperature marked in your recipes,
watch the baking and I'll give you many
of your Use me and I'll give you many
a vacation from the kitchen
SEE REVERSE SIDE FOR PRICE
"HERE LADY-

buy *this* gas range because it has Robertshaw oven-heat-control!" That, in effect, is what this lively little figure shouts when you hang him on your Robertshaw-equipped gas ranges. He ties right up with Robertshaw national advertising—running now.

He'll help you sell. He's a price tag, too. Write for a quantity.

ROBERTSHAW THERMOSTAT COMPANY
YOUNGWOOD, PA.

P. G. and E. Water Heater Drive Threatens Records

THREATENING to break all records of previous years, Pacific Gas and Electric Co.'s gas water heater campaign is in full swing.

During the first two weeks of the campaign, the company sold 447 automatic gas water heaters, approximately three and a half times the number sold for the entire month of the campaign conducted last year. P. G. and E.'s sales represent only about 3 per cent of the total, and indications are that dealer sales also are well ahead of last year.

These partial results are particularly interesting because the campaign follows closely upon the heels of the most intensive appliance drive ever inaugurated by the company, the "F.H.A. Farewell," during which more than $7,000,000 worth of gas and electric appliances were sold in the territory. Whereas a let-down might be expected after such an exhaustive drive, indications are that volume of sales is continuing at an even greater rate than last year.

Two financing systems for household appliances are offered buyers by the banking institutions in the territory: First, the regular F.H.A. plan on those appliances which come within the provisions of Title I; and second, the banks' own plans which are similar to F.H.A., with the same terms except that they advance only 90 per cent of the unpaid balance to dealers cooperating with them, and the dealers agree to repossess the appliances if necessary.

All the advertising, posters, window and floor displays, and newspaper space, stress P. G. and E.'s reduced gas rates which went into effect May 1.

■ ■

16 Companies Now Using Radio Transcriptions

Birmingham Gas Co., Birmingham, Ala., and the Department of Public Utilities, City of Richmond, Va., have recently joined the Mystery Chef radio program, using electrical transcriptions. The Birmingham company inaugurated its program May 1 with three Mystery Chef talks a week. The Richmond Department of Public Utilities started its program over Station WRVA on May 5.

There are now 16 companies having more than 500,000 domestic gas meters in operation that are using electrical transcriptions. One hundred and four additional companies are participating in the program through the original network of 13 radio stations. Distribution of the recipe book, "Be An Artist at the Gas Range," to date has been 652,000 copies.

■ ■

Harberson Candidate

Filing his application as a candidate on the Republican ticket for congressman from the first Oklahoma congressional district, C. C. Harberson, has resigned the post he has held for many years with the Cities Service Gas Co. at Bartlesville, Okla. Mr. Harberson, a former commander of the Oklahoma department of the American Legion, will seek office on an anti "New Deal" platform.

Barber-Greene Announces New Ditcher

Barber-Greene Co., Aurora, Ill., has just announced its new B-G Model 64-B Ditcher. The new model has all of the features of the previous 64 machine with a digging boom for a maximum of 5 feet deep. The boom is equipped with buckets which may be adjusted for 8 or 11 inches wide. A 3-foot 6-inch deep boom is available if desired. With a total overall width of only 48 inches, the new Barber-Greene is able to dig in the closest quarters. It is full crawler mounted and loads and unloads itself.

The 64-B incorporates automatic overload release sprocket which slips when an overload occurs and resets itself, full crawler mounting, three point suspension, vertical boom, milling action digging, self-cleaning buckets, and instantly reversible soil conveyor. The vertical boom permits digging in and around underground pipes and obstructions.

■ ■

Payne Furnace & Supply Expanding Activities

W. J. Strong, who has represented Payne Furnace & Supply Co., Beverly Hills, Calif., in the Texas-Louisiana territory for the past year, is making a survey of the middle western and eastern states to ascertain the best point for establishing a warehouse to serve Payne customers in that section of the country.

After an absence of a year, Bert P. Fisher is returning to the Texas-Louisiana territory and will make his headquarters in Houston, where it is expected to establish a warehouse stock for the Payne line.

John Miller, who for the past five and a half years has been connected with the A.G.A. Laboratory in Los Angeles, has been employed to handle testing of Payne products in the company's laboratory before they are submitted for final test to the A.G.A. Laboratory.

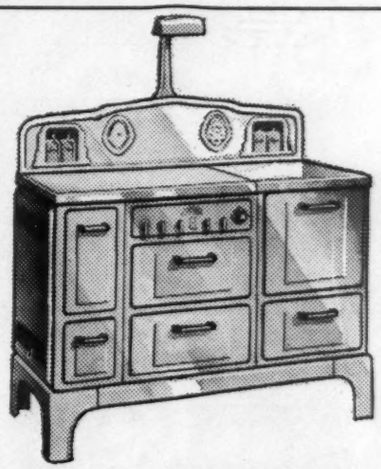
■ ■

Constitutionality of Texas Chain Store Tax Challenged

Constitutionality of the Texas chain store tax, which was passed by the last state legislature, has been attacked in a suit filed in the 98th District Court at Austin by five units of the Lone Star Gas Co. system. A refund of $5,534 is asked, which amount was paid under protest for licenses to operate gas appliance merchandising stores.

The suit was filed jointly by the Community Natural Gas Co., Texas Cities Gas Co., Dallas Gas Co., County Gas Co. and the Fort Worth Division of the Lone Star Gas Co.

To Have a SATISFIED CUSTOMER Sell Her a WEDGEWOOD



The novelty of seeing ranges beautiful and smartly styled is over. What people demand now is improved facilities for *cooking!* Cooking methods have changed. Radical improvements have been made in oven cooking, broiling and top-burner cooking.

Only Wedgewood has the three features which make it possible for your customer to realize the fullest value from a new range. Show her Wedgewood's *Extra-Low*-Temperature Oven, Astogril Broiler, and Speed-Plus-Simmer Burners. Instantly she will recognize that foods cooked on a Wedgewood will be better flavored, more nourishing, and easier to prepare.

James Graham Manufacturing Co.
San Francisco - Los Angeles - Newark - Portland

Feature No. 1
EXTRA-LOW Temperature Oven

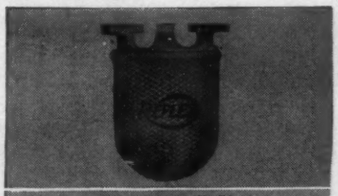
Feature No. 2
Astogril Broiler

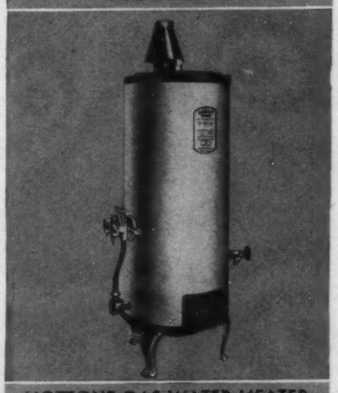
Feature No. 3
Speed-Plus Simmer Burners

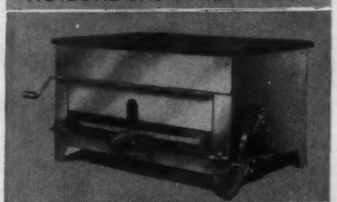
NO MEAT SHRINKAGE!
Wedgewood's *Extra-Low*-Temperature Oven saves pounds of meat—*all* flavor—and up to 20% of gas! Oven lights automatically.

SAVES ALL THE JUICES
Wedgewood's Astogril Broiler sears both sides of meat at once! No smoky odors, no flaming fats. Rustless.

CONTROLLED BOILING
Waterless cooking *without special utensils* possible on Wedgewood's Speed-Plus-Simmer Burners. No "burned dry" pans.


GAS MANTLE

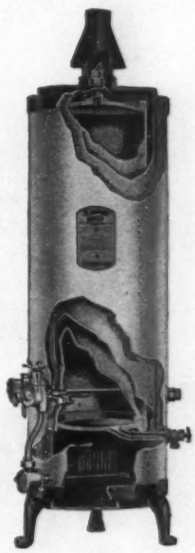

HOTZONE GAS WATER HEATER


HOTZONE BROILER-GRIDDLE

THE ESTABLISHED REPUTATION OF HOTZONE GAS WATER HEATERS

FOR low operating cost and minimum service requirement makes it easier for you to achieve a sales record and win one of the cash prizes in the nation-wide "CLEAN-UP" Contest on water heaters.

Manufactured as well as Natural Gas men—in their forward drive for greater gas utilization and sales in both new and old areas—will find the national reputation and proven efficiency of the WELSBACH HOTZONE Water Heater a real asset.

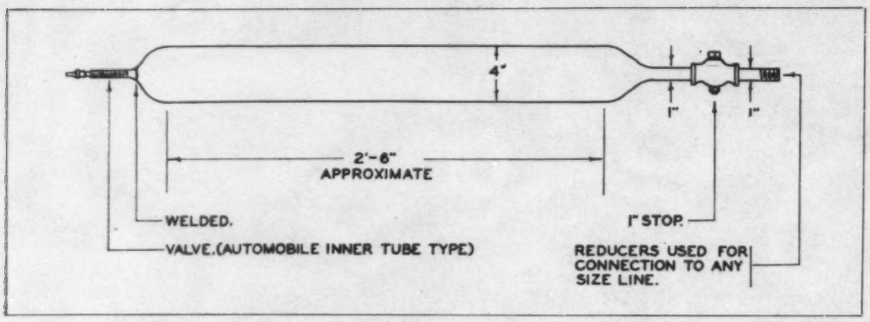


Welsbach Company

Gloucester City, N. J.

BRANCHES IN CHICAGO AND SAN FRANCISCO

Since 1887 Pioneers in the Manufacture of Gas Burning Appliances



Special device for blowing water from house and service lines.

Restoring Service After Flood in Wheeling, West Virginia, Area

By W. H. ADAMS

Special Agent, The Manufacturers Light and Heat Company

MUCH has been written about the "Notorious Flood of Saint Patrick's Day, 1936." To a gas man it presented a greater problem than that encountered by Saint Patrick, namely, that of driving the snakes out of Ireland.

In the area of Wheeling, W. Va., on the lines of the Manufacturers Light and Heat Co. and the Natural Gas Co. of West Virginia, both a part of the Columbia System, approximately 27,000 customers' meters were flooded. High water for Wheeling is not uncommon; therefore, pressure regulators and motor driven drip pumps are permanently installed in structures approximately 22 feet above the ground level, which would allow for a flood stage of about 55 feet.

At the crest of the March flood the water was 2 feet in these regulator houses. The greatest difficulty encountered was in maintaining service in the areas where houses were swept away or where the water current was sufficient to cause buildings to shift on their foundations; in either case, the service lines were broken and water rushed into the mains.

The work of re-establishing service began as the waters started to recede. Drips were pumped and the new drips were installed. As the water receded the workmen progressed to lower portions of the towns.

Inspections were made of all customers' house lines. Where they were not affected by the rush of water sufficiently to cause leakage, gas service was resumed. House lines, when found damaged, were repaired. To clear the customers' house lines and service lines of water, a short piece of 4-inch pipe (approximately 2½ feet long) swedged at either end and containing 100 pounds of air to the square inch, was connected to the house line at the highest point and the air pressure exerted into the house piping. This air pressure drove the water back into the mains where it was removed through drips or at meter connections. Air was readily available at gasoline filling stations located on higher ground, or by use of an ordinary bicycle pump. A sketch of this device is shown herewith.

In Cumberland, Md., approximately 1,000 meters were covered by water, but gas service was restored in much the same manner as in the Wheeling area.

Throughout the Pittsburgh group of properties of the Columbia system, approximately 35,000 meters were under water.

Gas service was completely restored in the Wheeling Area in one week by the faithful efforts of the regular employees.

In Cumberland complete service was restored five days after the floor subsided.

Long hours of hard work by employees, coupled with an understanding public, was responsible for the prompt and efficient re-establishment of gas service. Many customers have commended the employees of the Cumberland and Allegheny Gas Co. and the Natural Gas Co. of West Virginia for their untiring efforts in the restoration of service, and for their placing the comfort of the customers above their own welfare.

■ ■

National Tube Promotes C. R. Cox

C. R. Cox, formerly general superintendent of Ellwood Works of National Tube Co., on May 12, was elected vice-president in charge of engineering and operations of National Tube. He succeeds P. C. Patterson who has been associated with the company for 49 years and was vice-president in charge of engineering and operations since 1926.

Mr. Cox was graduated from New York University in 1914, and in 1918 became identified with United States Shipping Board Emergency Fleet Corp. In 1920 he entered the employ of Pittsburgh Crucible Steel Co. at Midland, Pa., and in 1925 became superintendent, and in 1927, manager of Park Works of Crucible Steel. In 1930 he was appointed superintendent of the Babcock & Wilcox Tube Co. plant at Beaver Falls, Pa. In 1934 he was appointed assistant general superintendent and in 1935, general superintendent of Ellwood Works of National Tube Co. Mr. Cox's office will be in Pittsburgh.

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Kahn Becomes Vice-President Republic Steel Corp.

Julius Kahn, who has been president since his founding of Truscon Steel Corp. 33 years ago, has resigned his position to become vice-president in charge of product development of Republic Steel Corp., Cleveland, Ohio.

Forrest H. Ramage has been promoted from assistant manager of the Advertising and Sales Promotion division to sales promotion manager and will work in conjunction with the new product development division.

Stanley A. Knisely, formerly manager of the Advertising and Sales Promotion division has been named director of advertising with direct supervision of all advertising of the corporation and its subsidiaries. Chester W. Ruth has been made assistant director of advertising.

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Gas Service Co. Campaign

During their May water heater campaign the new business departments of the Gas Service Co., Kansas City, Mo., sold or rented 745 automatic storage water heaters. Figures available up to May 16 indicate that gross sales reached $77,495 while the value of equipment rented during the same period amounted to $38,534, making a total of $116,029.

Beside the 745 water heaters the Gas Service new business departments have sold 602 ranges, and a large amount of heating equipment for this time of year. The water heater campaign closed on May 30, and during the current month the new business departments plan an extensive range campaign.

Profitable DITCHING

with Barber-Greene's

Barber-Greene's Superior features: the Vertical Boom, Milling Action digging, Automatic Overload Release, Self-Cleaning Buckets and many others give profitable digging. They bring results like 7c a foot for a Washington Water Department (partly through hardpan) . . . 5c a foot for a Texas Gas Company . . . 2½c a foot for hundreds of miles of pipe-line trench. Send a card for "Ditching Snapshots and Records." There is no obligation.

Standardized Material Handling Machines

BARBER GREENE

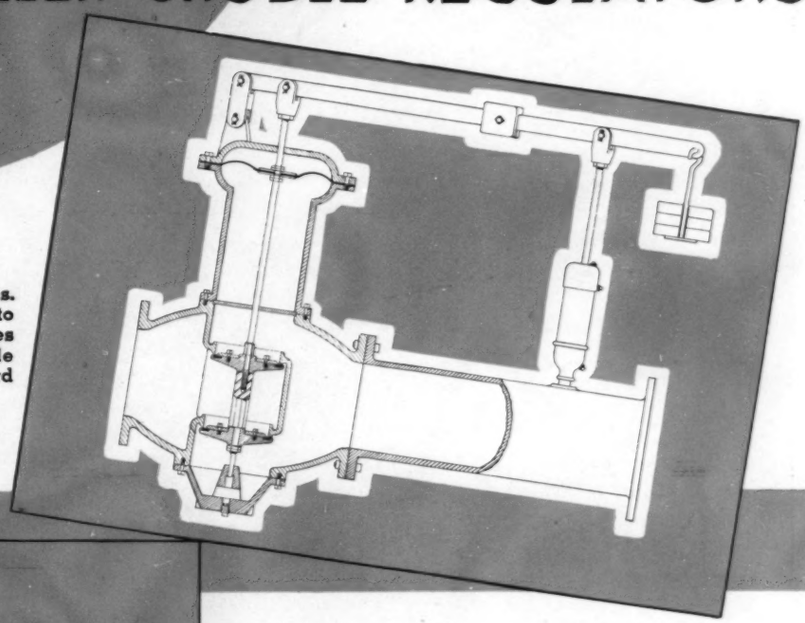
660 WEST PARK AVE., AURORA, ILL.

36-15

Maintain Accurate Control of Industrial Pressures

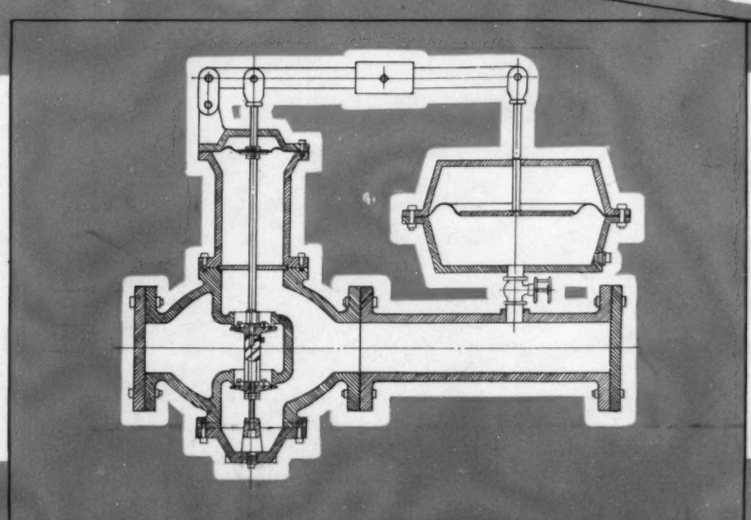
TO BRING INCREASED DEMAND

WITH MUELLER-GROBLE REGULATORS



STYLE 76
HIGH PRESSURE REGULATOR

Recommended for inlet pressures from 125 to 300 lbs. and reducing to a constant outlet pressure of from 5 to 50 lbs. These regulators are one of the many types of MUELLER-GROBLE regulators that are available for practically any application. All parts are standard and interchangeable, simplifying replacements.



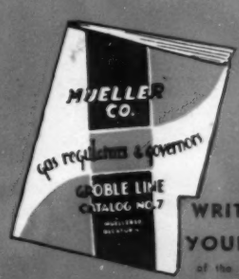
STYLE 126
INDUSTRIAL REGULATOR

Recommended for inlet pressures from 125 to 300 lbs. and reducing to a constant pressure of 3 to 16 ounces or from 1 to 5 lbs. as required. These valves have the same distinctive features that are found ONLY in MUELLER-GROBLE regulators—large hand-hole plates on both sides of the valve—balanced valves—renewable bronze seats—two piece valve stems—valve discs renewable through hand-hole plates without disturbing the diaphragm.

MUELLER CO., DECATUR, ILL.

MUELLER

GAS REGULATORS



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Tried and true—the stuffing-box principle as adapted by C. I. P. R. A. members in developing improved mechanical joints—and cast iron pipe which serves for a century. The section shown below has been in service in Philadelphia's gas distribution system for more than 100 years.

These mechanical joints have been proved gas-tight under all working pressures in field performance and by A. G. A. laboratory tests. Installed with common labor and a ratchet wrench. Cast iron pipe—bell and spigot, plain end or flanged—is available in 1¼ to 84 inches diameter.

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